Credit: Port of Seattle

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Final Land Stewardship Plan

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ABBREVIATIONS

ACE	Airport Community Ecology
AOA	Airport Operations Area
DBH	diameter at breast height
EEI	Equity and Environment Initiative
FAA	Federal Aviation Administration
FCSP	Flight Corridor Safety Program
FLAT	Forest Landscape Assessment Tool
IRA	Inflation Reduction Act
LiDAR	Light Detection and Ranging
LSP	Land Stewardship Plan
MU	Management Unit
Port	Port of Seattle
Principles	Environmental Land Stewardship Principles
RPZ	Runway Protection Zone
RSA	Runway Safety Area
RSJI	Race and Social Justice Initiative
SCAP	Strategic Climate Action Plan
SEA	Seattle-Tacoma International Airport
SEF	Sustainability Evaluation Framework
SMART	specific, measurable, achievable, relevant, and time-bound

Credit: Port of Seattle

Executive Summary

The Port of Seattle's Mission is to "promote economic opportunities and *quality of life* in the region by advancing trade, travel, commerce, and job creation in an equitable, accountable and *environmentally responsible manner*."

In June 2023, the Port of Seattle (Port) Commission adopted an Order to apply Environmental Land Stewardship Principles (Principles) to decision-making processes for planning, operations, and capital development. The Order directs staff to apply the Principles Port-wide for all land use groups, with a focus on ensuring that stewardship of trees, forest, and other habitat provides maximum ecological and community benefit in balance with development and operational needs.

The Order also identifies key Strategies intended to improve comprehensive application of the Principles to Port programs and processes. The Strategies recommend developing and adopting a Land Stewardship Plan (LSP) for the Seattle-Tacoma International Airport (SEA). The LSP is guided by stewardship objectives and goals that will improve the sustainability of SEA land use and operations by increasing the ecological and community benefits provided by trees, forest, and other habitat. The LSP objectives and goals comprehensively apply the Principles to existing SEA projects and programs. Specific actions are identified to achieve the programmatic objectives and goals, supported by site planning information identifying the location and extent of potential stewardship activities.

Objective 1. Establish and maintain an inventory of land stewardship resources

Goal: Establish benchmark conditions
Goal: Maintain a living land stewardship geodatabase
Goal: Track achievements

Objective 2. Protect and restore healthy and self-sustaining trees, forest, and other habitat

Goal: Use forest health assessment results to identify, prioritize, and implement tree planting
Goal: Use forest health assessment results to identify, prioritize, and implement invasive species removal to protect mature trees and restore native understory
Goal: Prioritize stewardship actions at sites with the greatest ecological and community equity benefits

Objective 3. Connect and expand existing habitat

Goal: Connect and expand contiguous habitat along stream riparian corridors
Goal: Enhance stream longitudinal connectivity to allow salmon migration

Objective 4. Offset operational and development impacts to trees, forest, and other habitat

Goal: Integrate environmental stewardship into capital development processes
Goal: Programmatically plan and implement compensatory stream and wetland mitigation
Goal: Identify actions with the greatest community equity benefit
Goal: Implement land stewardship practices in the existing built environment

Objective 5. Support community partnerships

Goal: Provide community engagement opportunities through the Land Stewardship program
Goal: Support Port community equity initiatives
Goal: Leverage interagency partnerships

Select actions to achieve Objective 1:

- Conduct inventory and establish benchmarks for ecological resources and equity (complete)
- Track annual tree planting and protection
- Conduct a new inventory every five years to track progress
- Report achievements annually via a publicly available environment and sustainability scorecard

Select actions to achieve Objectives 2 and 3:

- Plant 500 trees annually
- Implement invasive species maintenance on 20 acres of property annually
- Restore one acre of native understory shrubs and ground cover annually
- Create an index of prioritized sites using ecological and equity metrics
- Remove fish passage barriers

Select actions to achieve Objectives 4 and 5:

- Implement tree replacement standards for SEA jurisdiction
- Prioritize stewardship at sites providing the most community benefit
- Identify opportunities for future wetland mitigation
- Conduct at least two community stewardship events per year
- Actively seek interagency collaboration to coordinate planning and projects

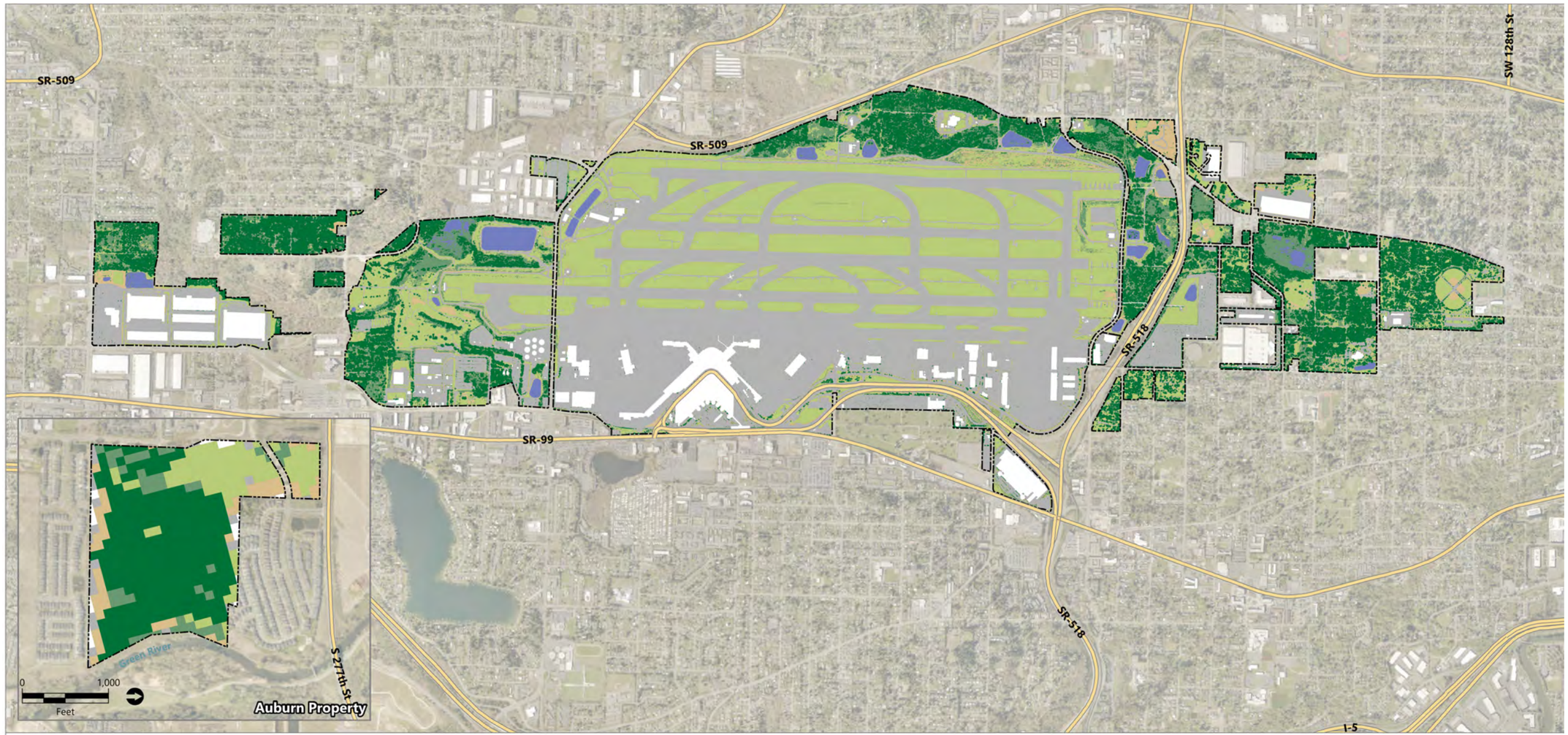
In achieving Objective 1: *Establish and maintain an inventory of land stewardship resources*, the LSP requires completing a comprehensive ecological inventory. The inventory supports the evaluation and analysis of stewardship sites and actions and informs and complements programmatic and project-specific planning and decision-making for operations and capital projects. This inventory includes attributes related to ecology, land use, and community equity.

Inventory of Land Stewardship Resources		
Ecological	**Land Use**	**Community Equity**
Land cover (e.g., forest, built) Streams and wetlands Other regulated areas (slopes; wells) Site-specific inventory: Invasive cover Tree cover High-value individual trees	Existing land use Future land use Operational areas Ground leases	Port Equity Index Urban heat island index Physical accessibility Visual accessibility Adjacency

As of the current LSP inventory[1], SEA owns 2,768 acres of land, 1,234 acres (44%) of which is impervious land cover (e.g., buildings, roads, airfield) (Figure E-1). Tree cover account for 466 acres (17%; Figure E-2), while shrubs, bare ground, and surface water account for 332 acres (12%) of land cover. There is a large amount of grass cover (736 acres; 27%), the majority of which comprises the vegetated strips between the runways on the airfield. Approximately half of SEA property lies within the Airport Operating Area (AOA) and has limited to no land stewardship potential.

[1] LSP inventory data based on 2021 land cover analysis and current 2023 Port ownership and AOA boundary.

Figure E-1
2021 Land Cover



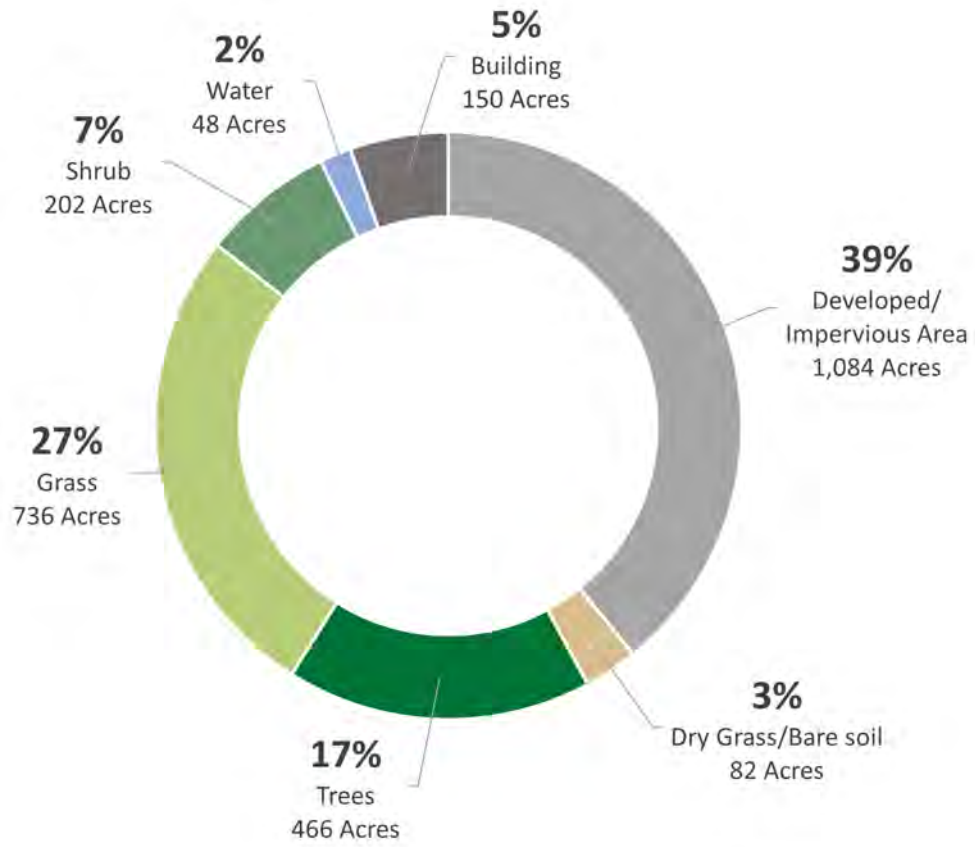
LEGEND:

- Port-Owned Aviation Properties at SEA
- Building
- Developed/Impervious
- Dry Grass/Bare Soil
- Forest
- Grass
- Shrub
- Water

NOTES:
1. Port-Owned Aviation Properties: Port of Seattle
2. Aerial Imagery: King County 2021
3. Land cover data were updated by the Port of Seattle using the 2021 King County aerial imagery
4. Land cover analysis (Auburn Property): USGS National Land Cover Database 2019

0 2,000
Feet

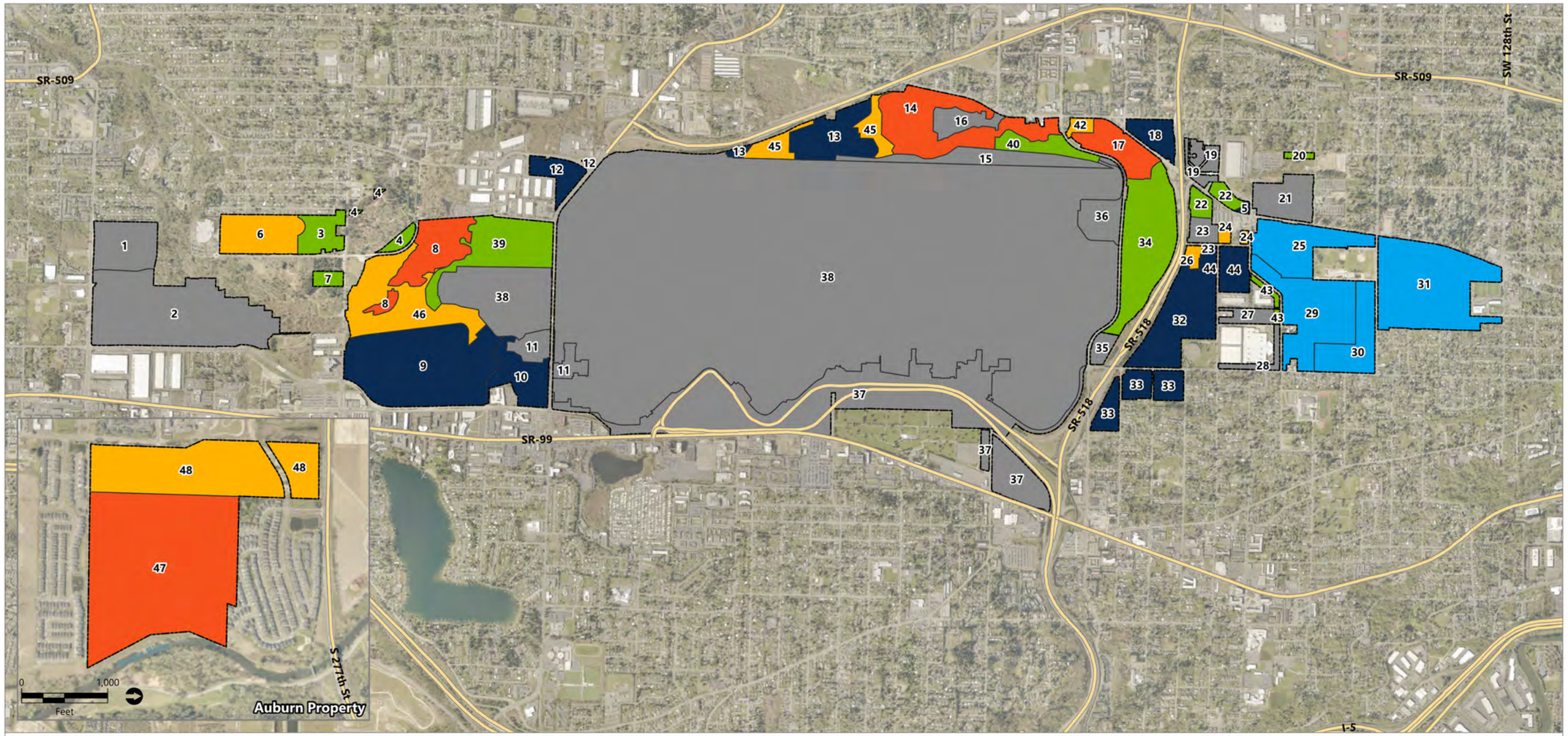
Figure E-2
2021 Land Cover Summary



Note: Total land coverage equals 2,768 acres.

The land use and land cover information is subsequently used to delineate 48 sites, called Management Units (MUs). Each MU is categorized by stewardship potential (Ecological Use, Public Safety and Maintenance, No Action). North SeaTac Park (214 acres) receives a special designation due to its unique status as a lease to the City of SeaTac, who operates and maintains the Park under the conditions of the lease (Figure E-3). Areas of ecological use comprise approximately 507 acres. Remaining operational and development sites account for the remaining 2,047 acres. While operational areas have limited to no stewardship potential, active maintenance and property management can maximize stewardship potential on development sites.

Figure E-3
Stewardship Recommendations by Management Unit



LEGEND:

- Port-Owned Aviation Properties at SEA
- Land Stewardship Plan Management Unit
- Ecological Use: Habitat Enhancement
- Ecological Use: Existing Mitigation
- Ecological Use: Potential Mitigation
- North SeaTac Park
- Public Safety and Maintenance
- No Action

NOTES:
1. Port-Owned Aviation Properties: Port of Seattle
2. Aerial Imagery: King County 2021

MUs with Ecological Use stewardship potential are further evaluated to identify specific actions (e.g., wetland mitigation, mitigate invasive threats, increase tree canopy) appropriate for each MU's existing condition (e.g., intact forest, disturbed forest, stream/wetland presence). Recommendations are provided as site plans that also include site maps and descriptions of existing conditions, including ecological, economic, and equity-based attributes.

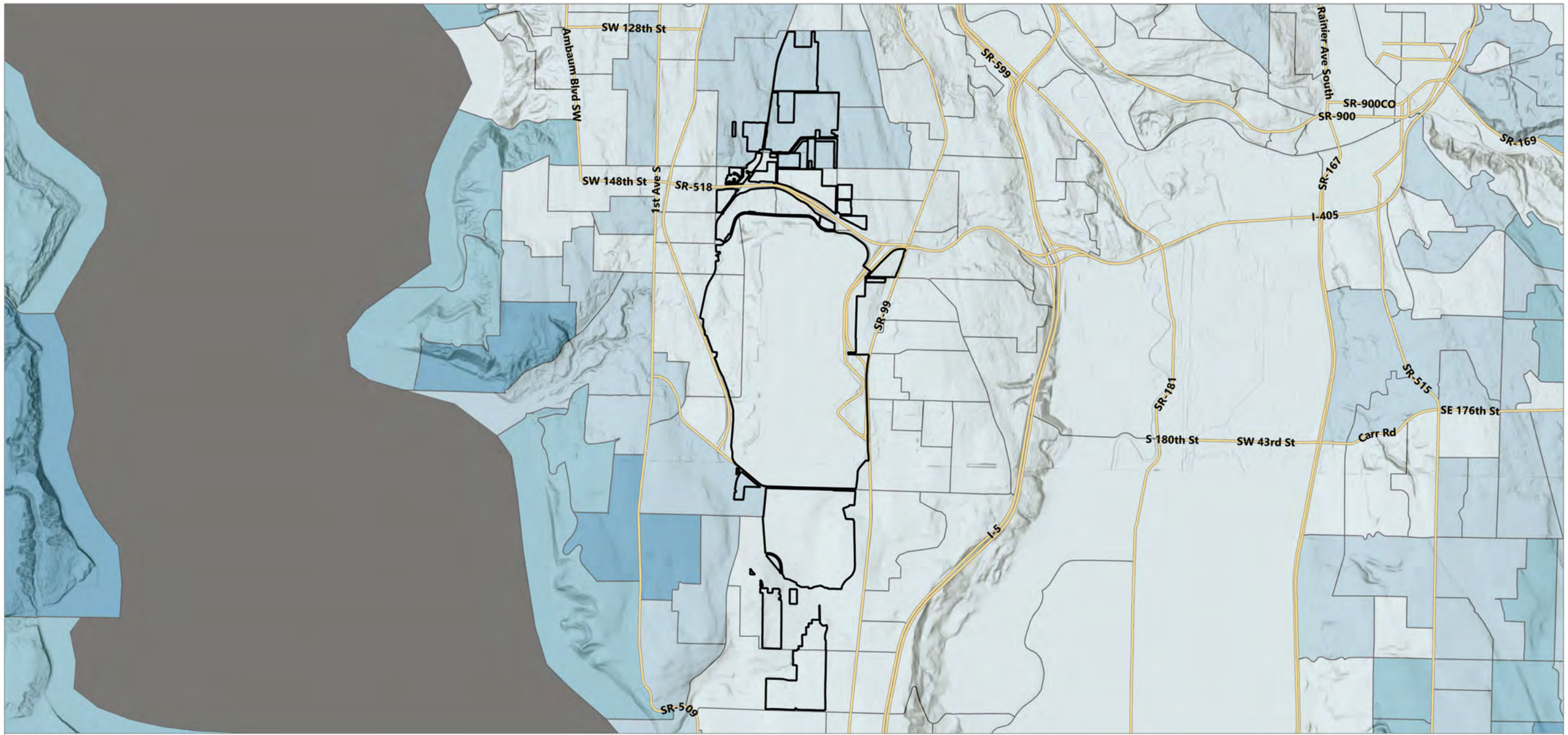
The site plans will also be used to inform decision-making for future operations and capital projects, including through the Sustainability Evaluation Framework environmental mitigation (trees, streams/wetlands), which, importantly, includes site selection. Sites with stream and wetland mitigation potential are evaluated in more detail in the Mitigation Opportunities Assessment, including providing concepts and estimating mitigation quantities and construction costs. The assessment is being used for multiple current capital projects and will provide a foundation to develop the mitigation strategy for upcoming Sustainable Airport Master Plan projects.

In addition to identifying what opportunities for stewardship are available at each MU, sites are prioritized (ranked) according to the relative ecological and community benefits. Ecological criteria are based on potential for connection and expansion of contiguous habitat along regulated stream corridors (Figure E-4), while community equity criteria include the Port's Equity Index (Figure E-5), heat island indexing, and original analyses for accessibility by the local community. Sites with greater potential ecological and/or community benefits receive greater priority for stewardship than sites that are less accessible or are isolated from other intact, contiguous habitat.

While multiple operational activities and future development plans constrain ecological opportunities on Port-owned aviation lands, there are over 500 acres of land with existing or potential for ecological use, and land stewardship potential can be maximized in developed areas as well through active maintenance and property management. The LSP sets clear objectives and goals and creates a roadmap of actions for achieving them on a defined schedule. Many of the actions have already been completed or have already been integrated into SEA Environment and Sustainability programs. Ongoing LSP tracking and reporting will ensure accountability and progress toward the LSP objectives and ultimately towards the Port's Environmental Land Stewardship Principles.

Figure E-4
Habitat Corridors

Figure E-5
SEA Equity Index



Auburn Mitigation Area, 2006 (Credit: Port of Seattle)

1 Introduction

Seattle-Tacoma International Airport demonstrates its core environmental principles and strategies through this Land Stewardship Plan, which is built upon the Port's successful history of environmental stewardship.

The Seattle-Tacoma International Airport (SEA) has a strong record of environmental land stewardship and consistently ranks high among United States airports for overall environmental performance. For example, SEA is the first major transportation facility in the United States to achieve Salmon-Safe certification (Port of Seattle 2016), which recognizes the Port's ongoing operations and water resources and habitat management programs that protect aquatic habitat in the vicinity of SEA and by extension the region's salmon populations. SEA implements low-impact development techniques to reduce stormwater runoff, furthering water conservation through multiple operational programs, and supports habitat restoration programs such as its Bee Pollinator Habitat and Queen Bee Breeding programs. To further its environmental and sustainability goals, the Port of Seattle (Port) seeks to formalize and improve land stewardship to balance the benefits to the environment and communities with the airport operations and associated development that provides jobs and drives the regional economy. Land Stewardship Principles and Objectives/Goals/Actions presented herein intend in great part to achieve such a balance.

1.1 What is Land Stewardship?

For the purposes of this document, land stewardship is defined as the responsible use and protection of the natural environment through conservation and sustainable practices to enhance ecosystem resilience and human well-being (Chapin et al. 2010). Other site attributes associated with land use,

community, and economic resources are considered in the context of strategic alignment with Port policy, guidelines, and processes for planning, operations, and development. The Land Stewardship Plan (LSP) proposes to manage trees, forest, and other habitat, including streams, wetlands, and their protective buffers.

By recognizing the value of land stewardship, the Port is proactively committing to comprehensively manage its natural resources in alignment with SEA planning, operations, and development. Land stewardship at SEA focuses on innovative site management solutions that protect natural resources while enabling SEA to continue to efficiently plan and operate its facilities.

1.2 SEA Land Stewardship Planning Context

Land Stewardship at SEA applies the sustainable use and protection of natural resources in the context of the agency Mission, Values, and policies. The Port seeks to enable economic development while improving overall quality of life in the communities the Port serves. Consequently, the Port's LSP objectives and actions seek to offer a path for sustainable planning, operations, and development by identifying opportunities to preserve and enhance resources while benefiting communities.

1.2.1 Port Mission, Vision, and Values

The Port's Mission, Vision, and Values provide the rationale and justification for developing the Land Stewardship Plan. The Port's Mission is to "promote economic opportunities and *quality of life* in the region by advancing trade, travel, commerce and job creation in an equitable, accountable and *environmentally responsible manner*."

The Port's Vision is to be "committed to creating opportunity for all, *stewarding our environment responsibly*, partnering with surrounding communities, promoting social responsibility, conducting ourselves transparently and holding ourselves accountable" (Port of Seattle 2017).

The Port's Values are as follows:

1. Respect: We uphold the dignity and value of every person.
2. Anti-Racism and Equity: We commit to dismantling institutional racism and ensuring equitable opportunities for all.
3. Integrity: We are honest, accountable, and ethical.
4. Stewardship: We *honor and care for the resources entrusted to us* for the benefit of future generations.
5. Excellence: We promote excellence through continuous improvement and innovation.

The LSP is intended to implement the environmental policy for programs related to habitat management while also integrating the policy into planning and operations. This includes balancing environmental considerations with economic and social policy as well as operational requirements.

For example, the LSP supports and enables economic development required to support SEA operations, uses equity as a tool for prioritizing actions, recognizes the impact of SEA operations on surrounding communities, provides a transparent view of SEA natural resources extent and condition, and seeks to inform and improve on the substantial land stewardship work already being accomplished through existing programs.

1.2.2 Port Century Agenda

The Port Commission adopted a Century Agenda in 2012 to establish the Port's vision for the next 25 years (Port of Seattle 2023a). Last updated in 2020, the Century Agenda identifies six overarching goals, each with a series of objectives designed to put the Port on course to achieving its long-term vision. The goals "set the course for the organization and a sound structural framework that helps operating divisions set tactical objectives to keep the Port on track to its destination" (Port of Seattle 2023a). Related to land stewardship, Goal 4 states the Port will "be the greenest, and most energy efficient port in North America." Specific objectives for Goal 4 include the following:

- Meet all increased energy needs through conservation and renewable sources.
- Meet or exceed agency requirements for stormwater leaving Port-owned or -operated facilities.
- Reduce air pollutants and carbon emissions.
- Restore, create, and enhance 40 additional acres of habitat in the Green/Duwamish watershed.

The Land Stewardship Plan is aligned with and will assist the Port with the implementation of Goal 4. The Plan is a mechanism to support operations and development while exceeding minimum regulatory requirements and can inform master planning and real estate development planning to prioritize locations for development and land stewardship. Trees and forest provide hydrologic services that augment direct stormwater management practices and reduce air pollutants and sequester carbon and greenhouse gases.

1.2.3 Port Equity Policy

The Port adopted an Equity Policy Directive on April 11, 2023, that institutionalizes equity into its organization for years to come, ensuring that the Port prioritizes just, inclusive policies and programs, both internally and externally.

In 2019, the Port became the first port authority in the country to establish an office of equity. In doing so, the Port committed time and resources to embed equity, diversity, and inclusion into the fabric of the organization. Also, by creating the Office of Equity, Diversity, and Inclusion, the Port acknowledged that for too long it had comfortably operated in an unjust, racist society that works to the benefit of a few at the expense of many. By failing to acknowledge and actively address these inequities, the Port realized that it was playing a role in perpetuating them. While the Port

still has a lot of work ahead, the Port has made incredible progress—in just four short years—in advancing equity, diversity, and inclusion in our programs, policies, and culture.

The adoption of the Equity Policy Directive moves the Port beyond simple compliance and mandates toward long-term commitment and sustainable transformation, embedding equity into the fabric of the Port so that the practice and value of equity live beyond current staff, leadership, and Commissioners. The Directive also means that the Office of Equity will develop an environmental justice framework and/or principles to guide future Port operations and process. This framework will be developed collaboratively with internal Port departments and external stakeholders and partners.

The Port also created a tool called the Equity Index to map inequities that exist within the region and use that information to direct resources towards the areas of greatest need. Port staff use the Equity Index to equitably guide funding decisions and broadly inform policy decisions across the Port. The Equity Index is an interactive map that displays a visual representation of social and environmental disparities in King County. Using 21 indicators within four categories, the Equity Index illustrates the degree to which different communities experience pollution burdens and social inequities. Across the region, there are significant variations in pollution exposure, access to economic opportunities, and the overall standard of living and quality of life.

1.2.4 Port Commission Environmental Land Stewardship Principles

In July 2023, the Port of Seattle Commission adopted an Order to apply Environmental Land Stewardship Principles (Principles) to decision-making processes for planning, operations, and capital development. The Order directs staff to apply the Principles Port-wide for all land use groups (operating areas, development sites, parks and open space, and restoration sites), with a focus on ensuring that tree, forest, and other habitat stewardship provides maximum ecological and community benefit in balance with development and operational needs. The Principles are as follows:

1. **Use a comprehensive approach to environmental land stewardship, including trees, forest, and other habitat.**
    a. Utilize landscape-scale inventory and assessment as the foundation for decision-making, to establish benchmarks of existing conditions and natural resources, and to tailor stewardship approaches to existing and/or planned land uses.
    b. Implement stewardship measures across all land use types (restoration sites, parks and open space, development sites, and operating areas), so the Port is consistent in our approaches while reflecting site-specific needs.
    c. Recognize the benefit of trees, forest, and other habitat at locations that are publicly accessible or near Port communities, because those areas provide environmental health and other benefits to impacted communities.

2. **Maximize opportunities to increase trees, forest, and other habitat as part of infrastructure planning and design.**
    a. Seek opportunities to expand and connect trees, forest, and other habitat to achieve greater benefits to the community and fish and wildlife. The Port will prioritize opportunities in or adjacent to existing contiguous trees, forest, and other habitat.
    b. If the Port is not able to add trees, forest, and other habitat to development sites because of operational or land use standards, then opportunities on alternative Port properties that further contribute to the environmental and community benefits will be prioritized.
3. **Apply an equity and environmental justice lens to environmental land stewardship.**
    a. Prioritize areas identified by the Equity Index as having the greatest need for tree and forest stewardship opportunities to improve and increase community health benefits, including air quality, heat island effect, community resilience, recreation, and mental health.
    b. In applying an equity lens, consider the historical and cultural value of the site and its assets.
    c. In applying an equity lens, consider the impact to the community and consider community consultation or engagement.
4. **Support Community Partnerships and leverage inter-governmental coordination and Port funds to catalyze stewardship processes and outcomes.**
    a. Prioritize expanding and supporting community-led environmental stewardship opportunities through grants and Port-sponsored stewardship events.
    b. Actively participate and support regional efforts and methodologies for stewardship of trees, forest, and other habitat.
    c. Coordinate with local governments to have Port's stewardship activities supportive of regional planning, including city and regional tree canopy goals and initiatives.
    d. Identify opportunities to connect and expand contiguous trees, forest, and other habitat across jurisdictions and property owners.
5. **Use a holistic approach to stewardship to ensure trees, forest, and other habitat are healthy and self-sustaining.**
    a. Use a landscape-based approach to stewardship. The Port will use landscape-scale inventory to broadly assess the extent and health of trees, forest, and other habitat and conduct site-based assessment as appropriate. This approach supports informed decision-making for comprehensively stewarding trees, forest, and other habitat across all land uses.
    b. Protect existing high-value resources and enhance impaired resources to support current and future environmental and community benefits. Port operations and development may disrupt trees; however, the Port will explore and prioritize protection over removal and replacement, whenever possible.

c. Actively steward trees, forest, and other habitat to ensure long-term viability to preserve resources.
d. Emphasize replacing invasive species with diverse, native species to ensure healthy and self-sustaining trees, forest, and other habitat.

The Port Order identifies three strategies to support the Principles: The first strategy is to adopt a Land Stewardship Plan in 2023, the second strategy is to adopt tree replacement standards at SEA, and the third strategy focuses on advancing shoreline restoration at Port maritime facilities and waterfront properties.

1.3 Regional Tree Policy Initiatives

In addition to the Port's mission and stewardship Principles, there are multiple environmental programs occurring throughout the region that have influenced the LSP development. The LSP aligns these regional plans, goals, and methodologies tailored to the context of SEA planning, operations, and development.

1.3.1 Salmon Safe

SEA is the first airport to have been certified as Salmon Safe. Salmon Safe is a certification process that aims to transform land management practices throughout the Pacific Northwest so salmon can thrive. The certification program promotes management practices for both farming and urban ecosystems to the benefit of salmon as well as other fish and wildlife. The initiative significantly advances restoration efforts in urbanized watersheds by developing urban aquatic protection guidelines and a citizen education campaign. SEA was the first airport in the United States to achieve Salmon-Safe certification in 2016. The ecological components of the Certification require SEA to inventory and map its natural resources and implement a management plan to protect and enhance stream riparian corridors. Additional components of the certification protect aquatic resources through water conservation measures, implementing best management practices for sediment control on construction sites, and ensuring limited use of herbicides and pesticides.

1.3.2 King County Strategic Climate Action Plan

With the same environmental stewardship focus, King County initiated the Strategic Climate Action Plan (SCAP) in 2015, a five-year plan for climate action. The plan recognizes the significance of trees in greenhouse gas emissions and preparing for climate change through its ambitious goal to plant 1 million trees by 2020, stating that "[t]rees store carbon and contribute to clean air and water, healthy habitat for salmon and other wildlife, and more livable communities" (King County 2015). King County achieved its goal in 2020 and updated the SCAP, setting a new goal to plant 3 million trees by 2025 (King County 2021a).

In 2020, parallel to the SCAP update, the County also developed a 30-year forest stewardship plan. The plan seeks to accomplish the following:

- Develop a shared county-wide vision, including priorities and goals associated with rural and urban forest cover and health, and strategies for achieving that vision over the next 30 years.
- Ensure that county-wide forests continue to play a role in mitigating impacts of climate change, while also guiding King County and partners toward strategies that allow us to meet multiple goals as we expand and enhance forest cover (King County 2021b).

1.3.3 Green Cities Partnerships

In recognition of airport impacts to the neighboring community, the Port set up the SEA Airport Community Ecology (ACE) Fund to fund benefits offsetting the impacts. Through ACE, the Port provided funding to the local SEA cities of SeaTac, Burien, and Des Moines to develop comprehensive stewardship plans that evaluate each city's existing forest health and conditions and identify opportunities to improve sustainability and health using the Green Cities Network model. The Green Cities Network includes more than ten cities through the Puget Sound region's King, Pierce, and Snohomish counties and has collectively served over 3 million people, with its aim to restore and steward more than 13,000 acres of land. In SeaTac, Burien, and Des Moines, each Green Cities stewardship plan has unique attributes but is organized around three core goals:

1. Improve city residents' quality of life and connection to nature and provide increased ecosystem benefits by restoring our forested parks and natural areas and enhancing urban forests.
2. Galvanize an informed and active community.
3. Ensure long-term sustainable funding and community support.

Strategies for how to increase canopy cover in each of these cities include planning for adaptive management; enrolling forested parkland and natural areas in active restoration and maintenance (including invasive species removal); planting and caring for trees throughout the cities; implementing a volunteer program; and securing stable, sustainable funding. The ACE-Funded Green Cities Partnership Plans do not include compliance as a strategy to achieve urban forest stewardship goals.

To date, the Airport Community Ecology Fund and associated Green Cities Partnership, in association with numerous invasive management actions, have planted approximately 2,250 trees and provided almost 1,000 tree saplings to citizens for backyard planting. This work is being extended through the current South King County Community Benefits Fund, which continues to provide grant money to support citizen-based Land Stewardship projects.

1.3.4 Federal, State, and Local Tree Equity Initiatives

There is broad recognition across agencies and stakeholders that trees, forests, and other habitats provide substantial ecosystem services to communities and that underserved communities are correlated with a lack of tree and forest canopy and the associated benefits they provide. A variety of programs at all levels of government include the following:

- **Federal Inflation Reduction Act.** The federal government has invested $1 billion in grants through the Inflation Reduction Act (IRA) to increase equitable access to trees and green spaces in urban and community forests. The IRA for Urban and Community Forestry grant program invests in projects that expand equitable access to urban tree canopy and its associated human and environmental health benefits; engage the local community in urban forest planning; and increase urban and community forest resilience to threats such as pests, climate changes, and storm events. The grant program will deliver "nature-based solutions to ensure a resilient and equitable tree canopy where more than 84 percent of Americans live."
- **Washington Tree Equity Collaborative.** The Washington Tree Equity Collaborative is a statewide partnership between American Forests and the Washington State Department of Natural Resources. The Tree Equity Collaborative will engage cities, community organizations, and stakeholders over the next three years to create rigorous and inclusive urban forestry programs throughout the state that increase tree equity by expanding neighborhood tree canopy coverage and health (DNR 2023).
- **King County Equity and Social Justice Strategic Plan.** The County's Equity Policy was adopted in 2010, and the Strategic Plan provides a comprehensive framework to be applied across all departments and programs (King County 2023). The plan implements a Vision that applies strategies to invest upstream and where needs are greatest in partnership with affected communities.
- **City Policies.** City equity policies are broadly applied and in principle include equal access to investment in natural and recreational resources. For example, the City of Burien's equity policy is to "provide opportunity for all people in Burien to benefit equally from City services, processes, and investments, regardless of identity, community, or socioeconomic circumstances" (City of Burien 2022). The City of SeaTac integrates equity requirements in its Comprehensive Planning equity planning, community well-being, and community identity (SeaTac 2021).
- **Seattle's Equity and Environment Initiative (EEI) and Race and Social Justice Initiative (RSJI).** Seattle's EEI and RSJI are citywide equity initiatives with the goal of eliminating racial disparities and achieving racial equity in Seattle. EEI is focused on justice and equity in the city's environmental programs and policies (Seattle 2023a). RSJI provides racial equity support to city departments to address inequities within the city government (Seattle 2023b).

1.4 Creating the Land Stewardship Plan

LSP's Importance to Habitat
The LSP is the mechanism for the Port to achieve its habitat goals at the Airport.

Consistent with the Port's Environmental Land Stewardship Principles, the LSP is intended to provide information to inform and guide decision-making for SEA planning, operations, and development. The LSP accomplishes this by inventorying environmental resources and other relevant land use characteristics and establishing a baseline condition. It then defines, locates, and prioritizes stewardship recommendations and actions. Similar to the Port's Century Agenda objective to "restore, create, and enhance 40 additional acres of habitat in the Green/Duwamish watershed and Elliott Bay" (Port of Seattle 2023a), the LSP also provides SEA the opportunity to develop specific, measurable, achievable, relevant, and time-bound (SMART) goals and objectives that align with overarching Port policy and the Environmental Land Stewardship Principles. The following objectives define the LSP.

Objective 1. Establish and maintain an inventory of land stewardship resources.

The rationale for creating and maintaining a land stewardship inventory is to establish benchmarks and track change over time to document achievements and identify ongoing needs. The inventory will also be used to inform the implementation of the subsequent LSP objectives, which are geared toward implementing specific actions to steward resources.

Objective 2. Protect and restore healthy and self-sustaining trees, forest, and other habitat.

Objective 2 aims to utilize habitat assessments as the basis for making LSP stewardship recommendations to improve habitat quantity and quality. Much of the undeveloped areas surrounding the SEA operating area were purchased for the purposes of noise (e.g., North SeaTac Park) and environmental mitigation (e.g., 177 acres of habitat mitigating for the impacts of the Third Runway). Many of the areas outside mitigation sites have not been actively maintained, and disturbance typical of all urban areas has resulted in degradation primarily by the impacts of invasive vegetation species (e.g., Himalayan blackberry, English ivy) that outcompete native understory vegetation species, threaten existing trees, and prevent natural tree recruitment and forest regeneration. Protection and restoration, therefore, are intended to protect existing trees and forest and replace invasive vegetation species with native understory plantings.

Objective 3. Connect and expand existing habitat.

The majority of land stewardship resources on Port property at SEA occur within or in conjunction with regulated aquatic resources (streams, wetlands) and adjacent upland areas that buffer and protect resource functions. These areas also provide a buffer between SEA operational and development areas and nearby communities that receive the brunt of environmental impacts such as noise and air emissions. The areas also provide a greenspace that provides a visual aesthetic and, in publicly accessible areas, recreational opportunities that benefit community health and wellness.

Objective 4. Offset operational and development impacts to trees, forest, and other habitat.

The Environmental Land Stewardship Principles recognize the impacts of SEA operations and airport-dependent development on the environment and the impacts to the communities served by SEA. Consequently, the Principles state that operational and capital development processes need to integrate criteria for offsetting impacts to trees, forest, and other habitat. The LSP proposes to implement mitigation of these impacts through the existing Sustainability Evaluation Framework (SEF), mitigating tree-clearing impacts, and identifying in-basin opportunities to implement compensatory stream and wetland mitigation opportunities that ensure that the mitigation benefits are realized in the adjacent communities that are most impacted. The SEF will identify opportunities for material salvage and re-use (e.g., re-using cleared trees in concurrent or future habitat projects) and incorporate alternative habitats (e.g., bee pollinator meadows, shrub habitat) in areas where trees and forest are not feasible due to flight safety or local planning requirements.

Moreover, most cities in the region, including Seattle and the airport communities (SeaTac, Burien, Des Moines), require trees cleared for development projects to be retained and/or replaced either on the development site or on City property such as schools and parks. The SEA development jurisdiction defined by the Inter-local agreement with the City of SeaTac does not currently administer tree replacement requirements. Therefore, the Principles require SEA to develop and adopt tree stewardship standards. The standards will be incorporated into existing Landscape Design Standards with which all capital projects are required to comply and will also apply to operations and maintenance activities (e.g., clearing around infrastructure in compliance with operational safety requirements).

Objective 5. Support community partnerships.

There is general recognition that ecological boundaries are disparate from and extend beyond localized geopolitical and real estate boundaries. This recognition is made apparent when considering watershed boundaries, stream riparian corridors, and fish and wildlife habitats and ranges. For example, regulated resources such as wetlands often span SEA and adjacent property boundaries, and mapped contiguous habitat comprise both SEA and its neighboring cities. In addition, it is apparent that the highest-value opportunities for stewardship lie not only in publicly accessible Port property at SEA but inside impacted communities. For these reasons, the LSP considers integration of SEA Land Stewardship with regional planning initiatives (e.g., King County 3 Million Tree Initiative; Green Cities Partnership methodology) and supports Port community benefits programs (e.g., South King County Fund). Specifically, SEA Environment and Sustainability staff will participate in implementing community programs by providing technical and planning support and perspective to internal and community stakeholders. Importantly, SEA will also identify and accommodate interagency coordination opportunities to enable Land Stewardship projects. For example, SEA has coordinated with the City of Burien to implement land use planning and environmental review in the West Miller Creek watershed. One of the leveraged outcomes is restoration of a piped segment of the stream under Des Moines Memorial Boulevard to 450 linear feet

of restored stream channel. The project constructed the stream restoration primarily on Port property, and SEA contributed $800,000 to the approximately $4M construction cost. These types of beneficial outcomes can be accomplished only through close cooperation among local and regional governments and agencies.

1.4.1 LSP Goals and Actions

Specific goals and actions are identified to help achieve each LSP objective. Goals and actions range in type, scale, and duration. Table 1 summarizes each objective and provides the supporting goals and actions.

1.4.2 Internal Outreach and Coordination

To identify LSP objectives and actions, the SEA Environment and Sustainability team coordinated with several other SEA departments to ensure the LSP aligns with internal Port policies and programs. Initial outreach occurred in March 2018, with subsequent meetings throughout subsequent months. Internal coordination supported the following:

- Developing LSP guidelines and objectives
- Documenting baseline site attributes at each Management Unit
- Developing the list of potential site-based management actions

The following departments provided feedback on developing management actions described in this LSP:

- Environment and Sustainability
- Aviation Operations
- Aviation Maintenance
- Aviation Properties
- Real Estate
- SEA Building Department
- Facilities and Infrastructure
- Planning

Table 1
LSP Objectives, Goals, and Supporting Actions

Goal	Action
LSP Objective 1. Establish and maintain an inventory of land stewardship resources.	
Establish benchmark conditions	• Inventory, map, and assess the condition of trees, forest, and other habitat attributes: - Landscape conditions (land cover; land use) - Site-specific conditions (forest health; high-value trees; trees on developed sites) o Regulated aquatic resources o Streams, wetlands, and their regulatory buffers o Other environmentally critical areas o Individual trees (high-value mature trees and trees on developed parcels) - Contiguous habitat (stream riparian corridors; stream culverts and fish passage) • Inventory, map, and assess community equity attributes
Maintain a living land stewardship geodatabase	• Conduct periodic land cover analysis, forest health assessments, and tree inventories to assess change in tree canopy and forest health • Update resource database for tree inventories, aquatic resource delineations, and contiguous habitat as it becomes available
Track achievements	• Document tree protection, tree planting, and invasive removal on SEA property • Document tree planting and invasive removal projects sponsored by the Port community equity initiatives in surrounding communities • Inventory and document SEA tree canopy and forest health • Report achievements for tree protection, tree planting, and invasive removal/understory planting in the annual environment and sustainability scorecard
LSP Objective 2. Protect and restore healthy and self-sustaining trees, forest, and other habitat.	
Implement tree planting to increase canopy and habitat function	• Plant 500 trees (two acres) annually to augment canopy and diversity
Restore invasive areas to a native forested condition	• Implement invasive species maintenance for 20 acres of property annually • Plant one acre of native understory shrubs and ground cover annually to increase forest structure and diversity • Protect 50 mature trees from invasive threats annually to maintain their function and value
Prioritize stewardship actions at sites with the greatest ecological and community equity benefits	• Create an index of prioritized sites using ecological and equity metrics

Table 1 (cont'd)
LSP Objectives, Goals, and Supporting Actions

Goal	Action
LSP Objective 3. Connect and expand existing habitat.	
Connect and expand contiguous habitat along stream riparian corridors	• Prioritize stewardship at sites in or contiguous to existing habitat corridors • Coordinate and support community projects within mapped contiguous habitat corridors
Enhance stream longitudinal connectivity to allow salmon migration	• Replace stream culverts and other artificial barriers with fish-passable structures
LSP Objective 4. Offset operational and development impacts to trees, forest, and other habitat.	
Integrate environmental stewardship into capital development processes	• Establish SEA development standards for trees, including tree definition, on-site retention, and replacement requirements • Develop and implement the Habitat and Restoration criteria of the Sustainable Evaluation Framework • Provide resource inventory and assessment documentation early in the project planning process • Identify opportunities to salvage native plant materials and woody debris before construction • Identify opportunities for constructing alternative habitats (pollinator meadows, shrub communities) in areas where trees and forest are not feasible • Assess feasibility of open-space credits for LEED and Envision projects
Programmatically plan and implement compensatory stream and wetland mitigation	• Complete a mitigation opportunities assessment identifying sites with potential for future compensatory stream, wetland, and tree mitigation • Include the Port's Equity Index scoring, public accessibility, and heat island information as part of Land Stewardship site management plans
Identify actions with the greatest community equity benefit	• Prioritize in-basin projects for stream and wetland compensatory mitigation • Prioritize sites that provide a buffer between airport operational and development and adjacent neighborhoods • Prioritize sites according to urban heat island and the Port's Equity Index scores • Conduct public engagement on projects with tree, forest, and other habitat mitigation requirements
Implement land stewardship practices in the existing built environment	• Replace missing, dead, and unhealthy trees in landscaped areas at existing development sites in accordance with project as-built designs and current landscaping standards • Mitigate public safety hazards • Identify and map vegetated areas adjacent to public-private infrastructure • Inventory and mitigate trees and other vegetation posing a hazard to life and infrastructure

Table 1 (cont'd)
LSP Objectives, Goals, and Supporting Actions

Goal	Action
LSP Objective 5. Support Community Partnerships.	
Provide community engagement opportunities through the Land Stewardship program	• Establish community stewardship sites on airport property • Conduct community events (planting and/or maintenance) • Integrate job training and workforce development opportunities • Maintain planted sites for a five-year period
Support Port community equity initiatives	• Coordinate with South King County Development Fund grant program - Participate on Grant Review Committee - Provide supporting information and technical expertise to grant awardees • Participate in Green Cities Partnership - Complete planting projects and community events through the Green Cities Partnership Urban Forest Management Plans for SeaTac, Burien and Des Moines - Provide public engagement opportunities to inform stewardship planning and activities • Conduct public outreach for the Land Stewardship Plan prior to formal adoption • Include Equity Index scores as part of site-specific resource assessments and management recommendations
Leverage interagency partnerships	• Facilitate and enable to the extent feasible stewardship projects sponsored by the SEA public partners • Utilize grant funding opportunities provided by federal and state equity and/or tree stewardship initiatives

2 Methodology

This section outlines the methodology to inventory ecological and community baseline conditions, identify landscape-scale LSP recommendations, and identify site-scale stewardship actions.

Methodology for the LSP combines baseline analysis of existing land use, existing land cover, and presence or absence of natural resources including streams, wetlands, and buffers to identify opportunities and constraints at SEA. It also documents existing community benefits and equity parameters such as heat island effects. The LSP then evaluates ecological opportunities to make LSP recommendations and identify specific site-based stewardship actions. The LSP evaluation assesses future land use, such as the Port's operation and future development constraints on LSP actions, and ecological improvement, such as future mitigation or habitat corridor expansion.

To track progress to achieving LSP goals, SEA will use the LSP methodology to update SEA baseline conditions and adapt LSP recommendations and site-based stewardship actions every five years, which aligns when there is a regional update to aerial imagery and land cover classifications.

The LSP methodology includes the following steps:

1. Define geographic extent
2. Define baseline conditions
    a. Assess current SEA land use and operations
    b. Assess ecological conditions
    c. Assess equity and community access

3. Evaluate and assign LSP recommendations
    a. Define Management Units
    b. Assess SEA operational and land use constraints
    c. Assess ecological values and threats
    d. Assign LSP recommendations
4. Evaluate and recommend site-specific stewardship actions at the Management Unit scale
5. Prioritize sites for stewardship with the greatest ecological and community equity benefit

Step 1. Define Geographic Extent

The geographic extent encompasses Port of Seattle-owned aviation properties. Port ownership at SEA changes over time with land swaps, acquisition, and real estate sales. In Step 1, Port ownership and the LSP geographic extent are confirmed. Port ownership defines areas with specific LSP recommendations and actions. Habitat corridors extend beyond ownership, and the LSP goals seek to support habitat opportunities beyond SEA properties through community partnerships and support.

Step 2. Define Baseline Conditions

Baseline data components provide the foundation of the LSP development and include both ecological and community conditions including equity parameters.

Step 2a. Assess Current SEA Land Use and Operations

Many Port-owned properties at SEA support aviation use with operational requirements and/or existing site development. Other properties have future development plans to support aviation use. There are also mitigation restrictive covenants that constrain future uses. A land use baseline needs to be defined prior to initiating an analysis for future ecological use and stewardship actions. Land uses could include the following:

Airport Operations Area

The Airport Operations Area (AOA) is a heavily regulated and highly restricted area, surrounded by a security fence to prohibit unwarranted access. The AOA includes airplane movement areas including the runway safety area, as well as the secured area of the airport terminal. Vegetation within the AOA is highly maintained and consists of mostly mowed grass. The grass seed mix is specified by Aviation Operations and is intended to detract wildlife. LSP stewardship actions are not feasible in the AOA.

Runway Safety Area

The Runway Safety Area (RSA) is defined by a boundary surrounding the runway that reduces the risk of damage to incoming and outgoing aircraft in the event aircraft under/overshoot or deviate from the runway. Entirely within the AOA, the RSA is required to be completely clear except for grass.

People, vehicles, and temporary objects are never allowed in the RSA while runways are in operation (Cassam 2018). LSP stewardship actions are not feasible within the RSA.

Runway Protection Zone

The Runway Protection Zone (RPZ) is a distinct area at the ends of the runway that protects people and property on the ground from incoming and outgoing aircraft in the event of a crash or emergency landing. Within the RPZ, separate regulations (including Object Free Area, Obstacle Free Zone, and Federal Aviation Regulation Part 77 restrictions) are in place to protect aircraft from obstructions. The Federal Aviation Administration (FAA) sets standards and regulations for the RPZ. The RPZ should be clear of objects and should not be used for public assembly. Vegetation is allowed in the RPZ, provided that it does not attract wildlife or become an obstruction. SEA is responsible for maintaining its RPZ standards. The Port owns the majority of the land in the RPZ, aside from property owned by the Washington State Department of Transportation along SR 518 and SR 509 (including the future SR 509 extension route) and a parcel of private property east of Des Moines Memorial Drive at 192nd Street (Cassam 2018). LSP stewardship actions are feasible within the RPZ but are constrained due to RPZ restrictions and specific site-scale conditions.

Private Ground Leases

Much of the Port-owned aviation property is leased to tenants and provides a consistent income to the Port. Lease agreement conditions and timelines vary for each property. The tenant holding the lease is responsible for vegetation and habitat maintenance, if applicable, and the Port does not have the authority to maintain these areas. Most of these sites are highly developed for aviation and industrial uses and include buildings and pavement. LSP stewardship actions are not feasible within existing ground leased areas. The Port could negotiate the terms and conditions related to stewardship actions on future ground leases.

City of SeaTac Ground Leases

The City of SeaTac leases several properties from the Port, including North SeaTac Park and SeaTac Community Center. While LSP stewardship actions may be feasible in these areas, the LSP does not propose any action in these areas. Concurrent to the LSP development, Forterra is working with the City of SeaTac through its ACE-funded Green City Partnership to assess canopy cover and forest health and identify areas for canopy expansion. Through that effort, Forterra is identifying potential actions on sites the City of SeaTac leases from the Port, specifically North SeaTac Park and SeaTac Community Center. The actions completed could be integrated into future LSP recommendations or could be reflected in future LSP land cover analysis updates.

Future Development and Planning

The Port has identified several properties for future development and planning. This includes sites that are slated to be leased to a developer for aviation or industrial uses. This also includes sites

identified for Port aviation use development in the proposed Sustainable Airport Master Plan. Because the baseline condition is subject to change in these areas, LSP recommendations are constrained and focus on protecting infrastructure and public safety.

Mitigation Restrictive Covenant

The Port has constructed multiple wetland and stream mitigation sites within the LSP's geographic extent. These sites include mitigation covenants that encumber future development. Existing mitigation restrictive covenant sites are not available for new regulatory mitigation activities. LSP stewardship actions on these sites focus on monitoring, maintenance, and potential expansion and/or connection to surrounding habitat corridors.

Flight Corridor Safety Program Mitigation

The FAA requires the Port to remove obstructions that pose a risk to aircraft, including tree obstructions. Following tree obstruction removal, the Port installs a native tree and shrub community on Port-owned sites, providing a tree replacement ratio of 4:1 to offset the tree obstruction removal. The LSP refers to these sites as Flight Corridor Safety Program (FCSP) mitigation sites. Future development or future planning proposals are encumbered in these revegetated areas because that could result in the loss of planted trees and shrubs. LSP stewardship actions could enhance these habitats and expand them to surrounding habitat corridors.

Step 2b. Assess Ecological Conditions

Ecological components that are summarized in Table 2. Data were gathered from multiple sources, which exemplifies how the LSP effort is strategically aligned with SEA operations, future SEA planning, and regional initiatives.

Table 2
Baseline Data Components Used in the Land Stewardship Plan

Component	Data Categories		Data Source
Land use and operational overlays	• SEA property data • Runway Safety Area • Runway Protection Area • Wildlife Hazard Management Plan • Future development plans • Culverts/fish passage	• Mitigation covenants • Flight Corridor Safety Program mitigation sites • Stormwater management and flood control	Aviation properties portfolio; SEA and local agency planning documents; interlocal agreements and other legal agreements
Environmental areas	• Wetlands • Wetland buffers • Steep slope hazard areas • Aquifer recharge	• Streams • Riparian buffers • Erosion hazard areas • Flood hazard areas • Seismic hazard areas	SEA and local agency records; SEA natural resource geodatabase

Component	Data Categories		Data Source
Land cover	• Forest • Shrub • Grass	• Water • Developed/impervious • Building • Dirt/bare ground	Forterra Green City Partnerships land cover data set: analysis based on U.S. Department of Agriculture (USDA) National Agriculture Imagery Program 2017 imagery, 2016 King County Light Detection and Ranging (LiDAR) data, and 2015 King County impervious surface land cover classification
Community equity	• Heat island maps • Visually accessible areas • Publicly accessible areas	• Port of Seattle Equity Index	CAPA Strategies Heat Watch program; Port of Seattle Office of Equity, Diversity, and Inclusion

Habitat Corridors

Ecological baseline conditions also include habitat corridors within and adjacent to SEA. Habitat corridors are contiguous habitats, allowing fish and wildlife to move freely without human-caused barriers. Contiguous corridors mitigate the impacts of broader habitat fragmentation, especially in urban environments. The LSP delineates contiguous habitat corridors primarily along Des Moines Creek, Miller Creek, and Walker Creek riparian corridors, including associated floodplain, wetlands, and upland buffers. Isolated forest cover was not included in the contiguous habitat delineation because of the high habitat fragmentation caused by development.

Step 2c. Assess Equity and Community Access

Step 2c compiles existing equity data and maps existing sites providing existing community benefits such as community planting areas, Port-owned areas with community access, and areas that need to consider public safety.

Equity Index Data

The Port is committed to taking a leading role in regional and national efforts to identify and address the root causes of inequity and social injustice. As part of this commitment, the Port created an Equity Index (Port of Seattle 2021), which is a series of interactive maps that illustrates the degree to which communities are experiencing social inequities and pollution burdens, as described in Section 1. The Equity Index consists of 21 indicators that fall within four equity categories (Economy, Livability, Accessibility, and Environment). The four categories were selected to align with the Port's Century Agenda Goals (see Section 1.2). Most of the data are collected at the U.S. Census block group resolution, which allows for an evaluation of the potential equity impacts of recommended site-based stewardship action.

Urban Heat Island Data

Heat islands are urbanized areas that experience higher temperatures due to loss of forest cover, extensive paving, and other factors. Cities and underserved communities in particular often have a high density of dark surfaces, like roads, parking lots, and buildings, which absorb and radiate the sun's heat energy. In areas with limited tree canopy coverage, these areas become "islands" of warmer air relative to the surrounding area. Increasing tree cover and vegetation cover lowers surface and air temperatures by providing shade and cooling through evapotranspiration (USEPA 2008). Tree planting is a cost-effective way to mitigate the heat island effect, especially when shading dark, heat-absorbing surfaces. Data from the King County Heat Watch study (CAPA Strategies 2020) were used to map heat islands in and around SEA.

Community Access Data

The SEA Environment and Sustainability team collects data related to community benefits, including the following:

- Port-owned property with existing community access including open space and parks
- Planting areas that have been installed through Port-led community planting events
- Highly visible undeveloped Port-owned land (defined as areas 50-foot offset from Port boundary)
- Undeveloped Port-owned land that could have tree hazard risks (defined as areas 100-foot offset from Port boundary)

Step 3. Evaluate and Assign LSP Recommendations

Step 3a. Define Management Units

The LSP identifies Management Units (MUs) to break down the full geographic extent into discrete units for analysis. MU boundaries reflect current operations and use and/or future development or planning constraints.

Management Unit

An MU is a planning area demarcated for the field assessment that, to some extent, has similar planning and operational objectives. The LSP uses MUs to align with ecological assessment methodologies used throughout the region, including the Forest Landscape Assessment Tool.

MUs are intended to reflect a landscape planning scale and are no smaller than five acres; however, due to SEA operations and development, several MUs are smaller than five acres. On Port-owned aviation properties, the MU reflects Port operations and development because these are critical to what can occur in the future on a site and constrain potential LSP recommendations. MU boundaries reflect the land use and current Port properties management (Port of Seattle 2014).

Step 3b. Assess SEA Operational and Land Use Constraints

Step 3b assesses LSP recommendations based on where SEA operations or SEA future development could occur. Tracking SEA future planning and development projects, such as the Sustainable Airport Master Plan, allows for the estimation of the potential impacts on MUs, including loss of forest habitat, and helps to plan for stewardship actions to mitigate those impacts.

In this step, MU boundary data are overlaid with the mapped land use/operational constraints. Each MU is then evaluated through the opportunities and constraints assessment decision tree (Figure 1).

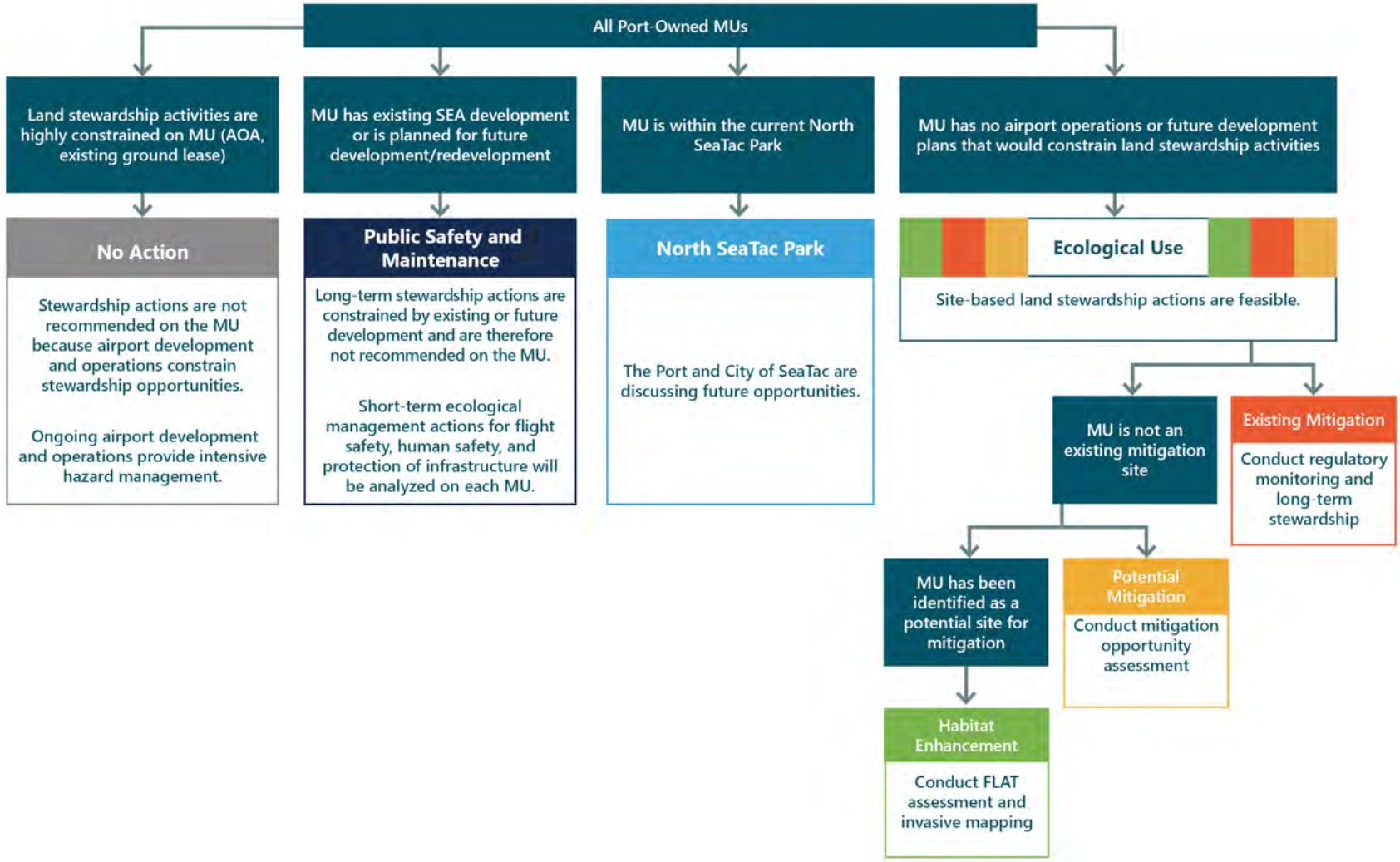
MUs that fall within operational areas that constrain land stewardship actions are identified with the LSP recommendation "No Action" and are removed from further analysis. MUs that are within existing or future development areas that constrain land stewardship actions are identified as "Public Safety and Maintenance." All other MUs are identified with the LSP recommendation "Ecological Use" and are further analyzed in Step 3b.

Step 3c. Assess Ecological Values and Threats

Using the MUs recommended in Step 3b as "Ecological Use," Step 3c provides an assessment for mitigation and habitat enhancement, restoration, and expansion potential. Each MU is evaluated through the ecological assessment decision tree (Figure 1). Sites with ecological use are sorted into four categories:

- MUs identified as "Ecological Use: Potential Mitigation" are further evaluated through the mitigation opportunities assessment. The detailed assessment identifies specific mitigation actions as described in the Mitigation Site Opportunity Assessment (Appendix A).
- MUs identified as "Ecological Use: Existing Mitigation" are existing regulatory mitigation sites with restrictive covenants and FCSP mitigation sites. Ongoing regulatory monitoring requirements define stewardship actions on these sites. Once the regulatory monitoring is complete, these sites will be managed based on the Long-Term Mitigation Stewardship Plan (Appendix D).
- MUs identified as "North SeaTac Park" are subject to ongoing discussions with the Port and the City of SeaTac. While these areas have stewardship opportunities, specific stewardship actions are not identified in the LSP.
- All remaining "Ecological Use" sites have the LSP recommendation "Ecological Use: Habitat Enhancement" and are assessed using the Forest Landscape Assessment Tool (FLAT; Green Cities Research Alliance 2013) and invasive vegetation is mapped using a desktop analysis and field verification, as described in the next sections.

Figure 1
LSP Recommendations Ecological Use Decision Tree



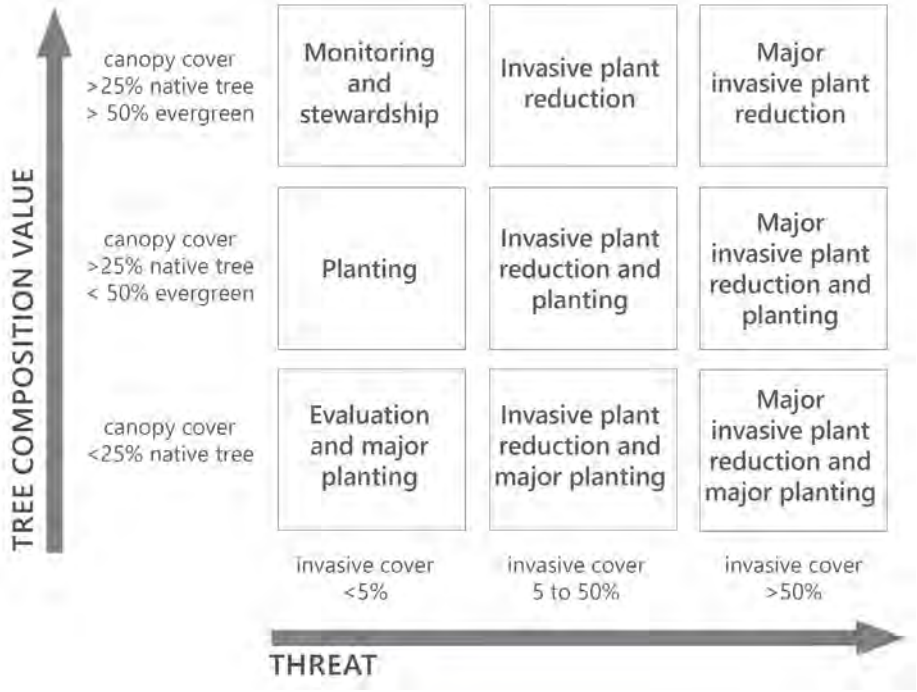
FLAT Assessment

The FLAT assesses ecological values and threats. Developed by Green Cities Research Alliance (in coordination with the U.S. Forest Service Pacific Northwest Research Station and in partnership with King County, Forterra, and the University of Washington), the FLAT provides a "rapid, systematic, flexible, and inexpensive environmental evaluation" (Ciecko et al. 2016). The FLAT is one part of the common methodology used by multiple cities in the region as part of the Green City Partnerships, as described in Section 1. The FLAT seeks to rapidly assess landscape conditions and then identify stewardship activities.

During the assessment, the FLAT step validates land cover, identifies ecological values and threats, and establishes site-based stewardship actions at each identified MU using the Green Seattle Partnership Tree-iage Matrix. As shown in Figure 2, the Tree-iage Matrix weighs the forest value and forest threats to inform site-based stewardship actions. Forest value is defined by tree composition including native canopy, conifer canopy, and opportunity for new canopy.

For the purposes of the Port's FLAT analysis, forest threats are defined as the threat of invasive species, which is ranked by the percentage of invasive cover: high (more than 50%), medium (5% to 50%), and low (less than 5%). Table B-1 in Appendix B provides a summary of the field data collected during the FLAT assessment.

Figure 2
Green Seattle Partnership Tree-iage Matrix



Note: Original version was developed by Green Seattle Partnership showing City of Seattle acreages (Ciecko et al. 2016).

Invasive Species Mapping

Invasive species can outcompete and kill native species, inhibit understory regeneration, and alter plant community composition. These changes can impact habitat structure and function for wildlife and reduce biodiversity. A variety of invasive plant species are present in the Port's MUs, including Himalayan blackberry (*Rubus armeniacus*), English ivy (*Hedera helix*), scotch broom (*Cytisus scoparius*), Japanese knotweed (*Reynoutria japonica*), and reed canary grass (*Phalaris arundinacea*).

As part of the FLAT methodology and to better identify specific invasive vegetation threats, aerial analyses of invasive species cover was performed for each MU, followed by a site visit to visually estimate the general level of invasive species cover for the MUs.

High-Value Tree Mapping

High-value trees are defined as trees that are large for their species (e.g., large-growing trees with a diameter at or above 30 inches) or trees with unique historical, ecological, or aesthetic significance. Designation as a high-value tree is somewhat subjective, and final determinations will be made by professional arborists or foresters. High-value trees are located through Port-owned lands and provide unique habitat, historical, and aesthetic value. Often invasive species threaten to impact the health and vigor of these high-value trees, potentially leading to mortality. The LSP will map high-value trees and collect tree data attributes including species, height, and diameter, as well as whether invasive species are present or absent on or directly adjacent to the tree. This work was started in 2023 and will continue as part of the LSP.

Step 3d. Assign LSP Recommendations

The result of Steps 3a and 3c is an LSP recommendation for each MU and sufficient information to determine site-based stewardship actions in Step 5. MUs are each assigned one of six LSP recommendations:

- No Action
- Public Safety and Maintenance
- North SeaTac Park
- Ecological Use: Existing Mitigation
- Ecological Use: Potential Mitigation
- Ecological Use: Habitat Enhancement

Step 4. Evaluate and Recommend Site-Based Stewardship Actions

Step 4 determines site-based stewardship actions within an MU. This step identifies specific actions consistent with the LSP recommendations in Table 3. This step also assesses community benefits. The result of Step 4 is a site plan for each MU that provides specific site-based stewardship actions based on the MU's unique constraints, ecological potential, and community benefits.

Community Benefit Evaluation

This step overlays the equity and community baseline data described above to evaluate potential site-based stewardship actions that offer community benefits within each MU, including the following:

- Promote community planting areas
- Allow community physical access
- Improve visual aesthetics
- Manage tree hazards that pose a public safety hazard (e.g., tree fall in residential areas, road rights-of-way, and publicly accessible areas)

Potential Site-Based Stewardship Actions

Table 3 summarizes the potential site-based stewardship actions that may occur on an MU recommended for ecological use or infrastructure and safety maintenance.

Table 3
LSP Recommendations and Site-Based Stewardship Actions

LSP Recommendation	Potential Site-Based Stewardship Actions
Ecological Use: Existing Mitigation	• Conduct regulatory monitoring as required • Conduct long-term mitigation correction actions for perpetuity • Maintain visual aesthetics along Port boundary for adjacent community
Ecological Use: Potential Mitigation	• Identify mitigation opportunities – Offset concurrent impacts – Establish mitigation bank – Establish advanced mitigation sites
Ecological Use: Habitat Enhancement	• Enhance habitat – Install forest and understory planting communities – Improve forest structural complexity – Remove invasive vegetation • Expand habitat – Plant trees to increase forest cover – Install shrubs in areas where forest cover is not feasible • Connect habitat – Expand habitat adjacent to habitat corridors – Remove culvert and daylight fish-passable channels • Provide opportunity for community outreach and engagement • Provide community access where appropriate
North SeaTac Park	• No action; subject to City of SeaTac long-term lease

LSP Recommendation	Potential Site-Based Stewardship Actions
Infrastructure and Safety Maintenance	• Manage lands to reduce hazards – Minimize operational hazards (e.g., wildlife, obstructions) – Address public safety hazards including hazard trees • Protect infrastructure
No Action	• No action due to existing operational and land uses that constrain LSP actions

Step 5. Prioritize Sites for Stewardship

To meet LSP goals and inform the Port's decision-making on where to conduct LSP site-based stewardship actions, MUs identified for Ecological Use are prioritized based on the following attributes:

Community Benefits and Equity

1. Opportunity to mitigate heat island effects
2. Opportunity to enhance visually accessible areas
3. Opportunity to enhance publicly accessible areas
4. Opportunity to improve Port Equity Index

Ecological

1. Opportunity to improve and/or expand a habitat corridor
2. Opportunity to connect existing habitats
3. Opportunity to remove culvert and daylight fish passage

The MUs are scored based on how many prioritization attributes are met if LSP stewardship actions are completed. The MUs with the highest scores best meet Port LSP goals and are the top priority.

Type	Prioritization Attribute	Management Unit Score
Community Benefits and Equity	1. Reduce heat island effects	• If the MU has areas with a morning heat index over 62.6 degrees Fahrenheit, it scores 2 • If the MU has areas with a morning heat index between 60.4 and 62.6 degrees Fahrenheit, it scores 1 • If the MU only has areas with a morning heat index below 60.4 degrees Fahrenheit, the MU scores 0
	2. Enhance visually accessible areas	• If the MU is on a highly visible corridor, it scores 1 • If not, the MU scores 0
	3. Enhance publicly accessible areas	• If the MU has existing physical public access, it scores 2 • If not, the MU scores 0
	4. Improve Port Equity Index	• If the MU has a Port Equity Index score of Low, it scores 0 • If the MU has a Port Equity Index score of Very Low, it scores 1
Ecological	5. Improve and/or expand a habitat corridor	• If the MU is adjacent to habitat corridor and expands and improves that corridor, it scores 2 • If the MU is on a habitat corridor and improves that corridor, it scores 1 • If not on/adjacent to a habitat corridor, the MU scores 0
	6. Connect existing habitats	• If the MU can establish a connection between existing habitats, the MU scores a 2
	7. Remove culvert and daylight fish passage	• If the MU has a mapped culvert, it scores 1 point for each culvert that would be removed as part of a stewardship action • If not, the MU scores 0

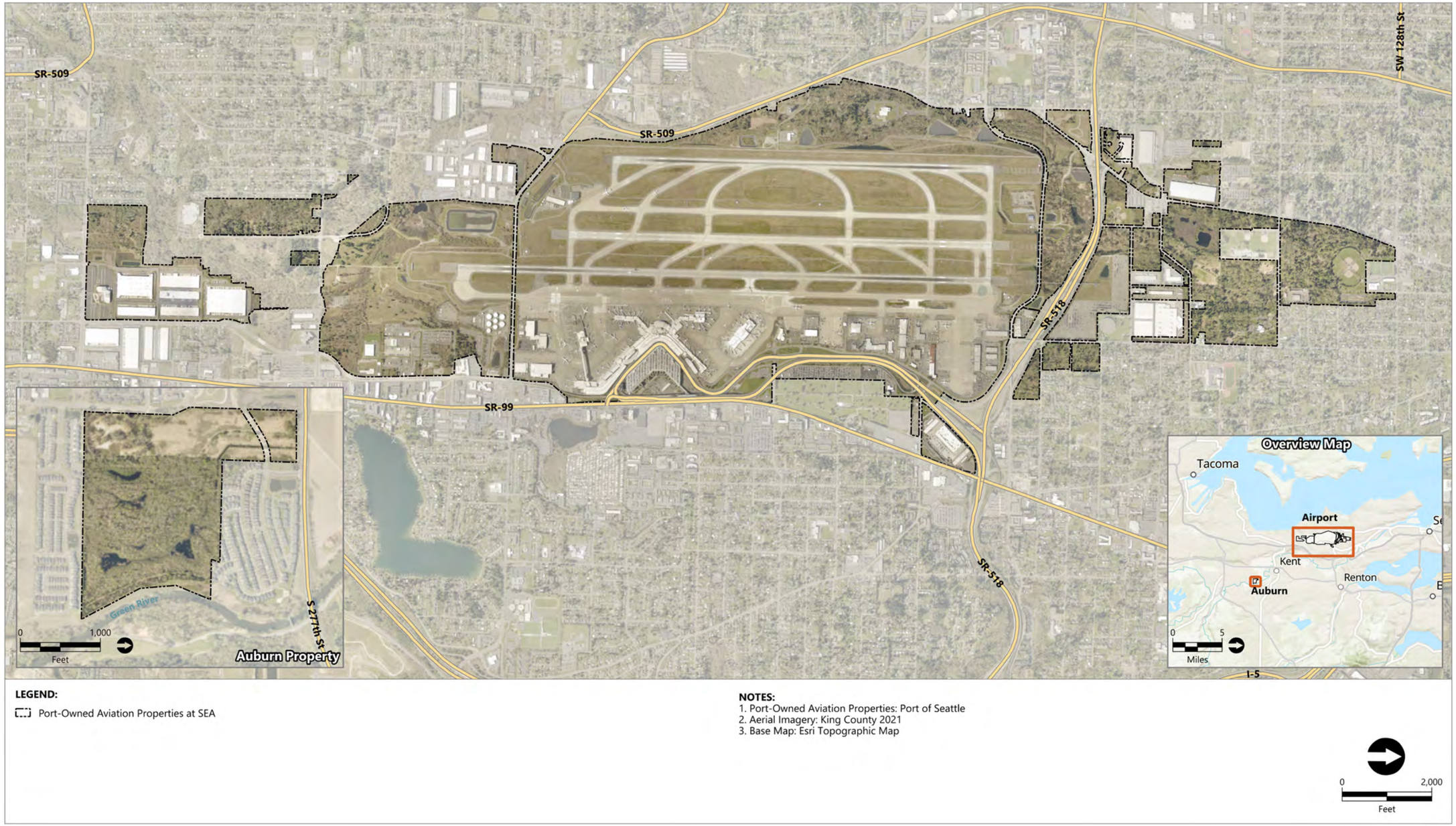
3 LSP Baseline

This section inventories the SEA land use, ecological, and community access LSP baseline conditions.

3.1 Geographic Extent

The LSP identifies stewardship recommendations for Port-owned properties at SEA and the surrounding area (Figure 3). The LSP area also includes an existing Port-owned mitigation site and adjacent undeveloped parcel in the city of Auburn, as shown in Figure 3.

Figure 3
LSP Geographic Extent



LEGEND:

Port-Owned Aviation Properties at SEA

NOTES:
1. Port-Owned Aviation Properties: Port of Seattle
2. Aerial Imagery: King County 2021
3. Base Map: Esri Topographic Map

0
2,000
Feet

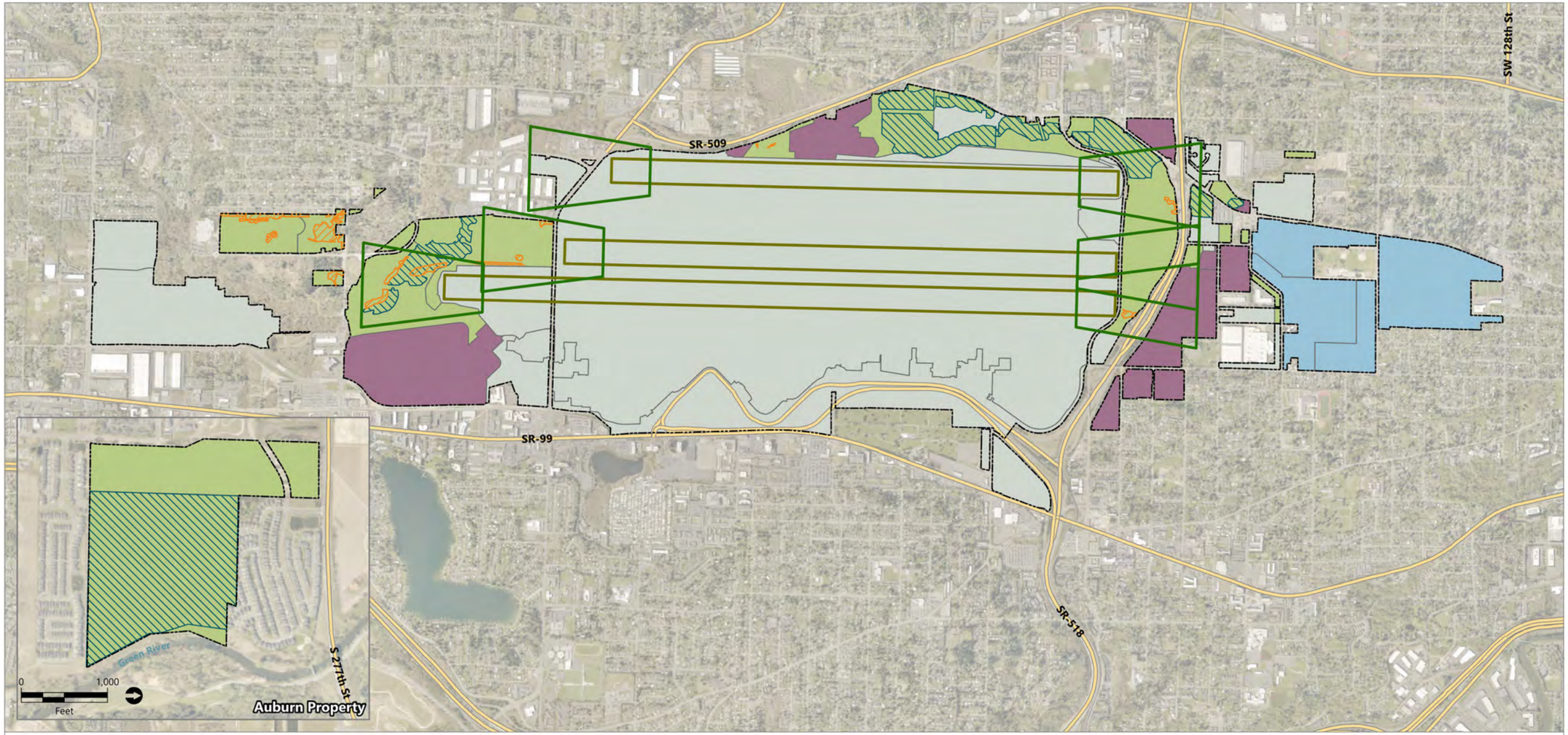
3.2 Land Use

Figure 4 summarizes existing SEA environmental, operational, and other development land uses that constitute opportunities and constraints informing LSP recommendations. The AOA and existing private ground leases are categorized as "Airport Operations and Existing Private Ground Lease Areas." Locations with potential for future airport-dependent, operational development or similar redevelopment are identified as "Potential Development/Redevelopment Areas." These areas are based on current SEA master planning and real estate planning and are subject to change as new information becomes available. Due to its special characteristics, North SeaTac Park is designated as a stand-alone planning area. All remaining areas are noted for "Ecological Use."

- Airport Operations and Existing Private Ground Lease Areas: 1,756 acres
- Potential Development/Redevelopment Areas: 284 acres
- Ecological Use Areas (not including existing compensatory mitigation sites): 353 acres
- North SeaTac Park: 214 acres
- Compensatory Mitigation Sites: 187 acres
- FCSP Mitigation Sites (these sites are located within Ecological Use Area): 17 acres

Figure 4 also maps the existing RPZ and RSA, which are restrictive flight operations areas intended to protect public and flight safety. Existing restoration areas are also indicated, including compensatory Third Runway stream and wetland mitigation and FCSP mitigation sites. Third Runway mitigation sites have land use covenants running with the land that, with certain exceptions, protect the sites from redevelopment or altered land use in perpetuity.

Figure 4
2023 Land Use and Restrictive Areas



3.3 Ecological Inventory

The ecological inventory included information on land cover, critical areas, and habitat corridors:

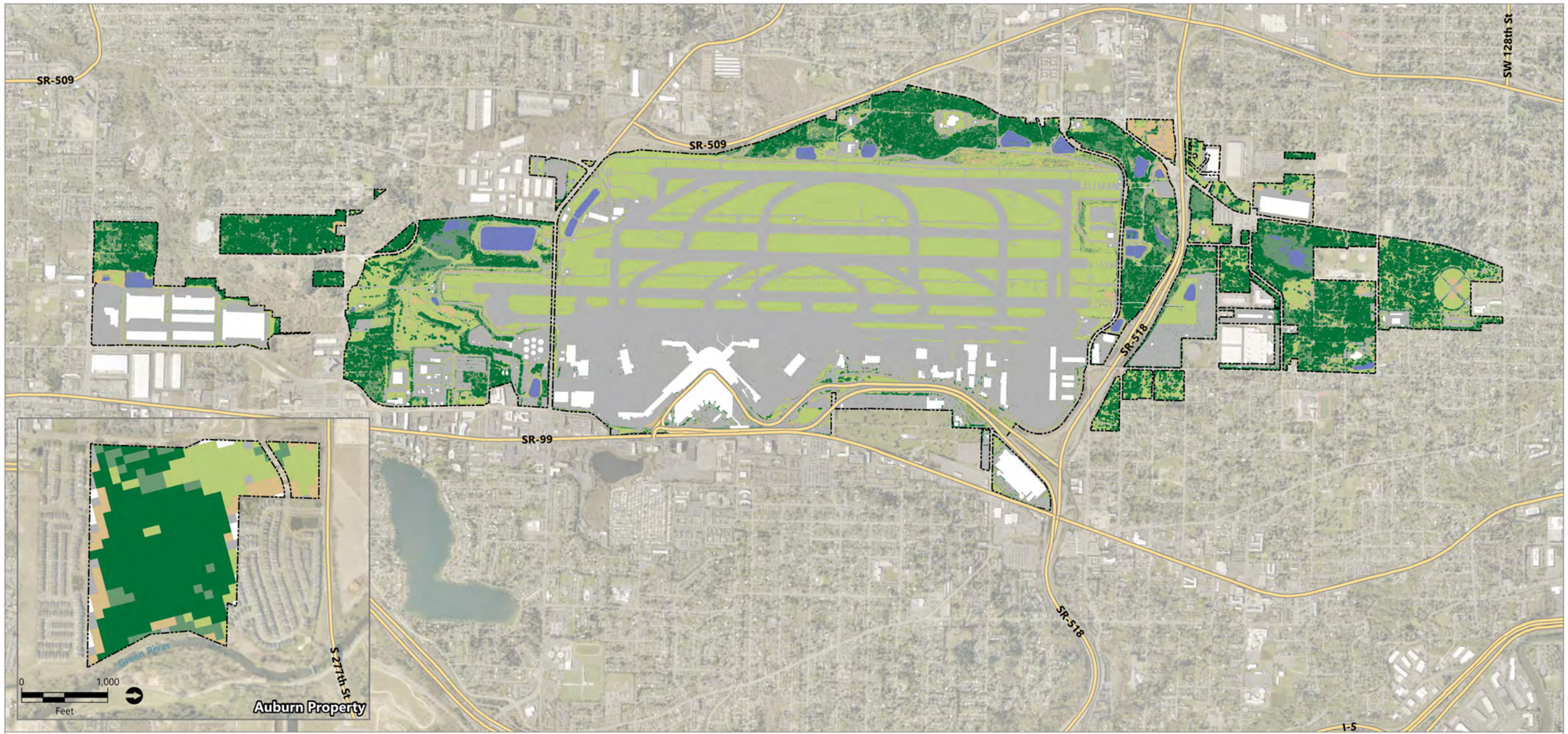
- **Land cover** denotes the physical land type, such as forest, agriculture, wetland, and open water.
- **Critical areas** in King County are lands that support certain unique, fragile, or valuable resources, as well as areas with natural hazards. These areas include land at high risk for erosion, landslides, earthquakes, or flooding; coal mines; and wetlands or lands adjoining streams, rivers, and other water bodies (King County 2018). The Port, along with the cities adjacent to SEA, SeaTac, Burien, and Des Moines, inventories critical areas. For the purposes of the LSP, this section focuses on wetland, wetland buffer, stream, and stream buffer critical areas because these areas directly influence site-based stewardship action recommendations and prioritization. Mapped steep slope critical areas also impact stewardship feasibility and are mapped on the specific stewardship management plans in Appendix C. Other critical areas are not typically seen on SEA properties, such as coal mines and seismic areas.
- **Habitat corridors** are contiguous habitats that allow fish and wildlife to move freely without encountering human-caused barriers.

3.3.1 Land Cover

Land cover analyses use high-resolution aerial imagery and Light Detection and Ranging (LiDAR) to classify and map land cover types. In 2023, the Port updated the land cover analysis with the best available data including the most current aerial imagery from 2021. The analysis included the SEA Auburn property in order to get a full understanding of all SEA land cover categories and acreages. Figure 5 presents the results. The 2023 data set is composed of the following:

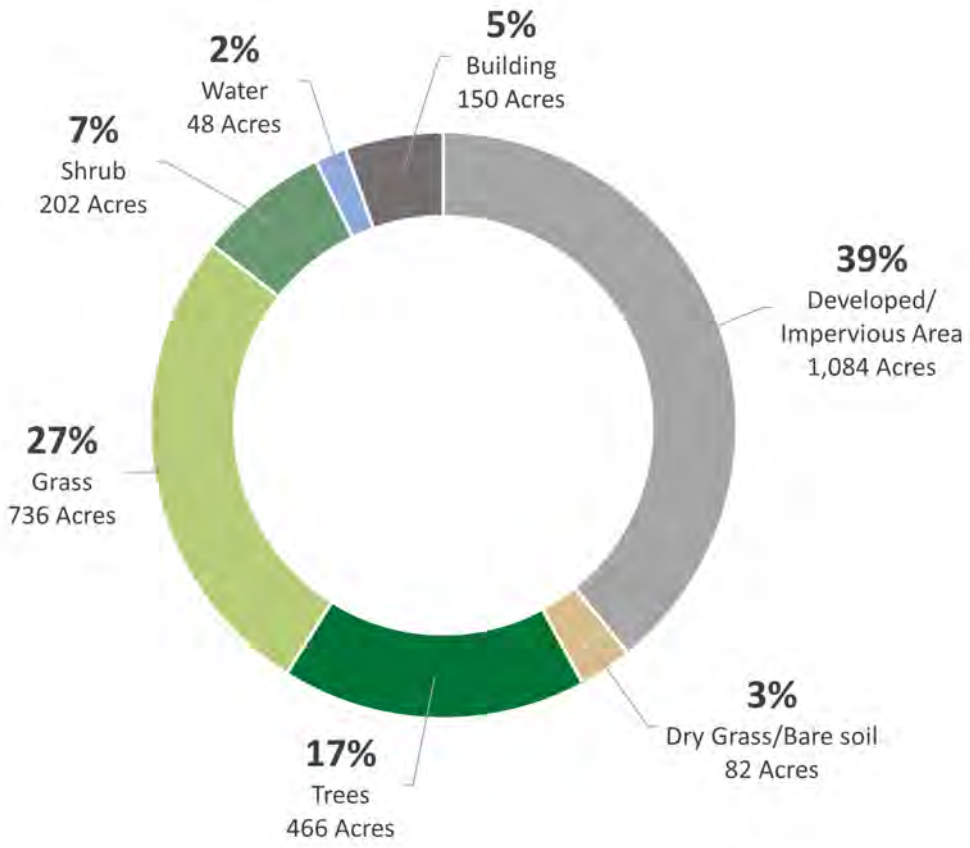
- 2021 King County aerial imagery provided the basis for updating land cover to reflect multiple SEA development projects.
- The 2019 U.S. Geological Survey (USGS) National Land Cover Database was used to distinguish land classifications at the SEA Auburn property.
- 2016 King County LiDAR data were used to distinguish shrubs from tree canopy at SEA. A height maximum of 15 feet was utilized to distinguish trees from shrubs in all areas except Port mitigation covenant areas, in which case 30 feet was utilized to distinguish trees from shrubs. A height of two feet was utilized to distinguish shrubs from grass.
- King County's 2015 land cover classification data set was used to refine building and impervious surfaces classifications at SEA.

Figure 5
2021 Land Cover



Port-owned aviation properties within the LSP area include nearly 2,768 acres of land within and adjacent to SEA and the SEA Auburn property. The land cover data analysis found that most of this land (1,084 acres) falls in the developed/impervious classification (Figure 6). The second-highest land cover classification is grass (736 acres). Tree cover is the third-highest land cover classification at 466 acres, followed by shrub (202 acres), buildings (150 acres), dry grass/bare soil (82 acres), and water (48 acres).

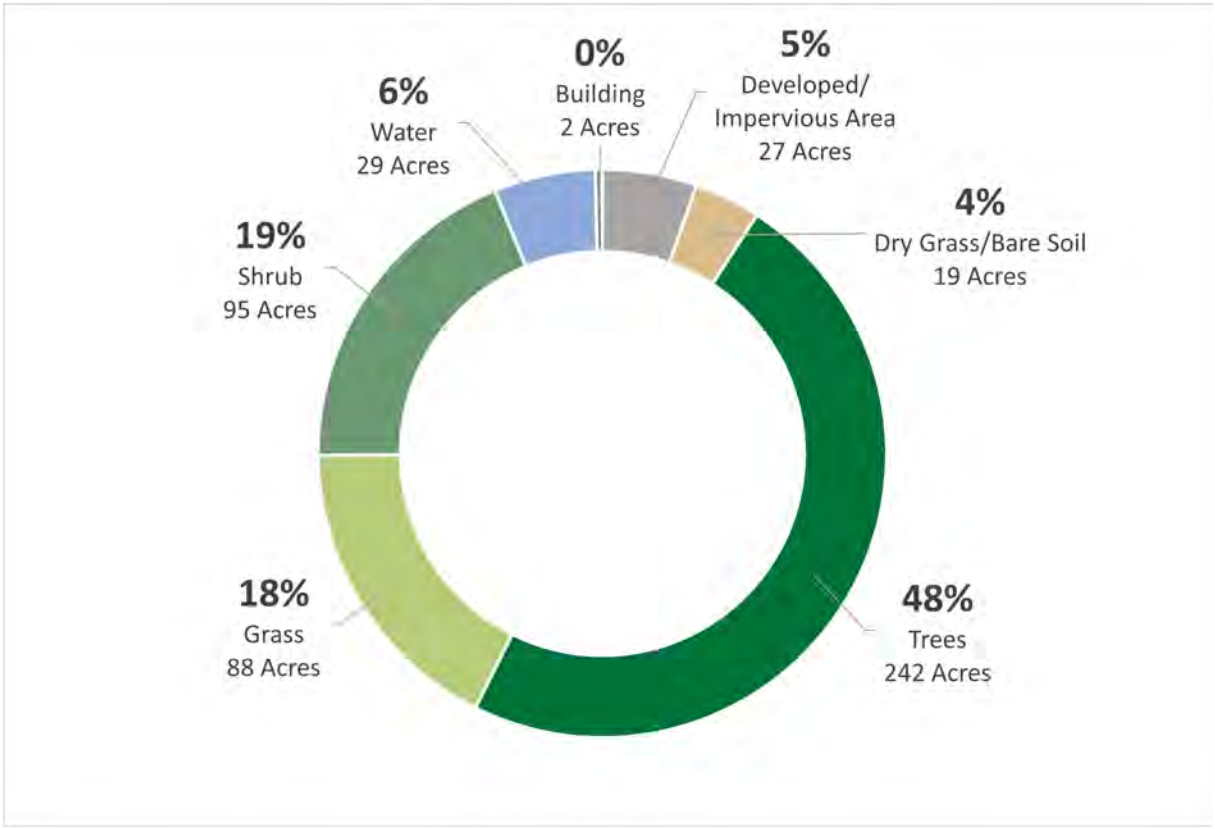
Figure 6
2021 Land Cover Summary



Note: Total land coverage equals 2,768 acres.

The Ecological areas identified in Section 3.2 (see Figure 4) represent nearly 500 acres of land (this includes the SEA Auburn property). Ecological areas have opportunities to plant trees through stewardship actions and increase tree and forest canopy cover. Land cover in this area is dominated by forest, which represents 242 acres or 48% of the area. The second highest land cover classification is shrub (95 acres). Figure 7 below summarizes the existing land cover classifications within Ecological areas.

Figure 7
2021 Land Cover Within Ecological Areas



Note: Total land coverage equals 502 acres.

In addition to land cover, the Port also tracks tree planting at SEA. This aligns with the King County 3 Million Trees initiative described in Section 1. The Port has planted nearly 31,000 trees. Of those, 8,000 trees were planted off Port property provided as in lieu fee funding to the Washington State Department of Transportation and the City of SeaTac to mitigate FCSP tree obstruction removal. The remaining 23,000 trees were planted on Port property through critical area mitigation actions and community planting events.

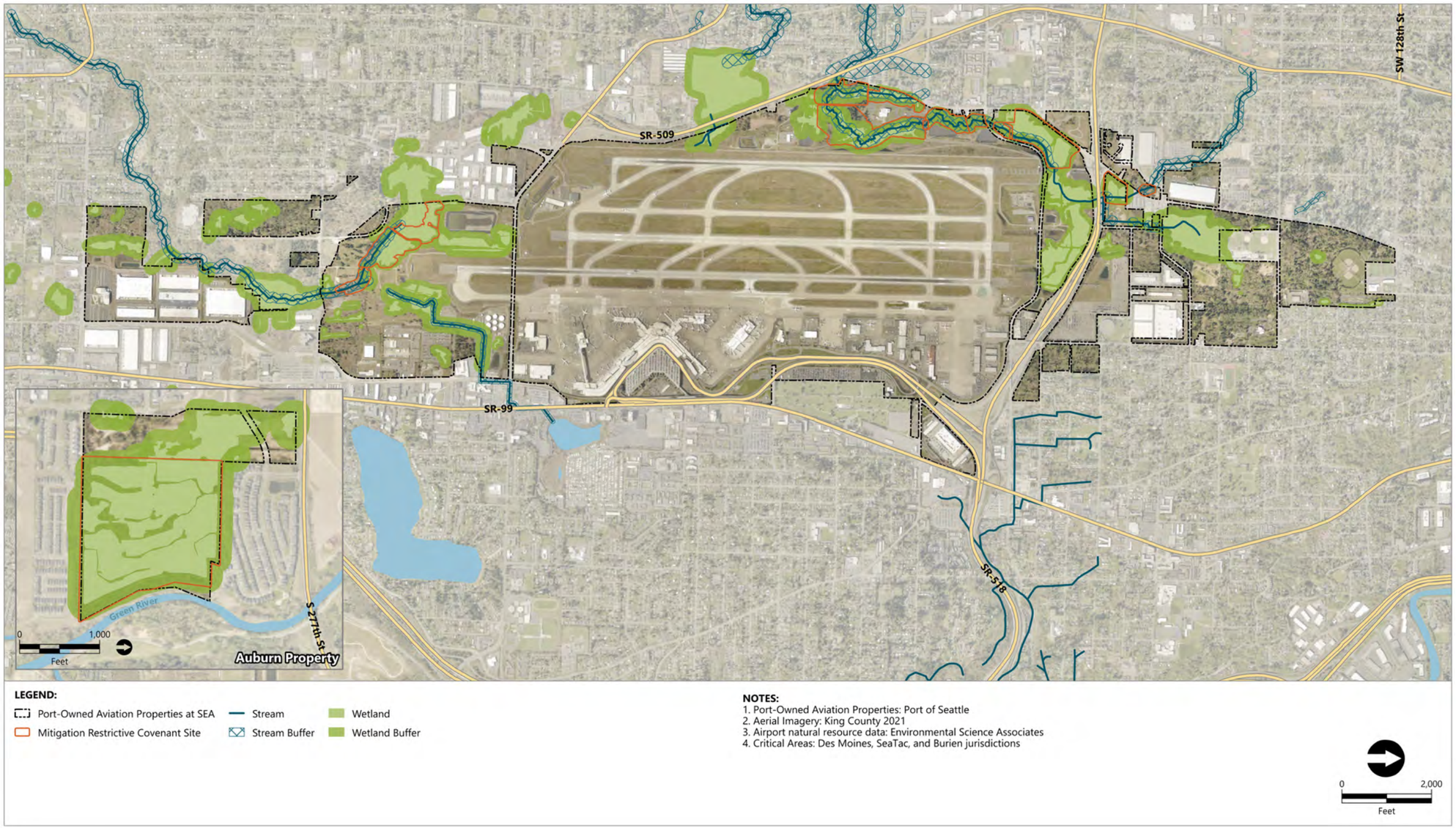
3.3.2 Critical Areas

Critical areas in and adjacent to SEA include land that is at high risk for erosion, landslides, earthquakes, or flooding; coal mines; and wetlands or lands adjoining streams, rivers, and other water bodies. This section identifies wetlands, streams, and their associated buffers. Located in the Green/Duwamish River watershed, there are multiple regulated critical areas within and adjacent to the Port's aviation properties. Four creeks and their tributaries run through multiple aviation properties. Des Moines Creek is south of SEA, Walker Creek is to the west, Gilliam Creek is to the east, and Miller Creek is to the north and west. There are also multiple wetlands on aviation properties. Much of the creeks' instream and riparian habitats, wetlands, and wetland buffers are heavily affected by airport operations and urban development. Figure 8 provides an overview of the mapped critical areas. The Port collects and maintains critical areas data through field delineations and assessments and coordination with the cities of SeaTac, Des Moines, and Burien.

3.3.3 Habitat Corridors

Contiguous habitat in the LSP area is primarily defined by the Miller Creek, Des Moines Creek, and Walker Creek sub-watersheds both on Port lands and extending to adjacent communities to the north, west, and south. The stream riparian corridors, wetlands, and upland buffers form contiguous habitat corridors. Contiguous habitat does not include forested land cover because of considerable habitat fragmentation due to development. Figure 9 shows contiguous habitat within the LSP area.

Figure 8
Mapped Critical Areas



Notes:
1. SEA property and lease data are provided by Port of Seattle.
2. Airport natural resources data are provided by Port of Seattle and managed by Anchor QEA. Jurisdictional critical areas are provided by each jurisdiction (Des Moines, SeaTac, and Burien).
3. Critical areas shown include streams, stream buffers, confirmed wetlands, wetland buffers, lakes, and ponds. Steep slopes, erosion hazards, landslide hazards, seismic hazards, liquefaction susceptibility, jurisdictional ditches, and other areas are not shown.

Figure 9
Habitat Corridors

3.4 Equity and Community Access

3.4.1 Equity Index

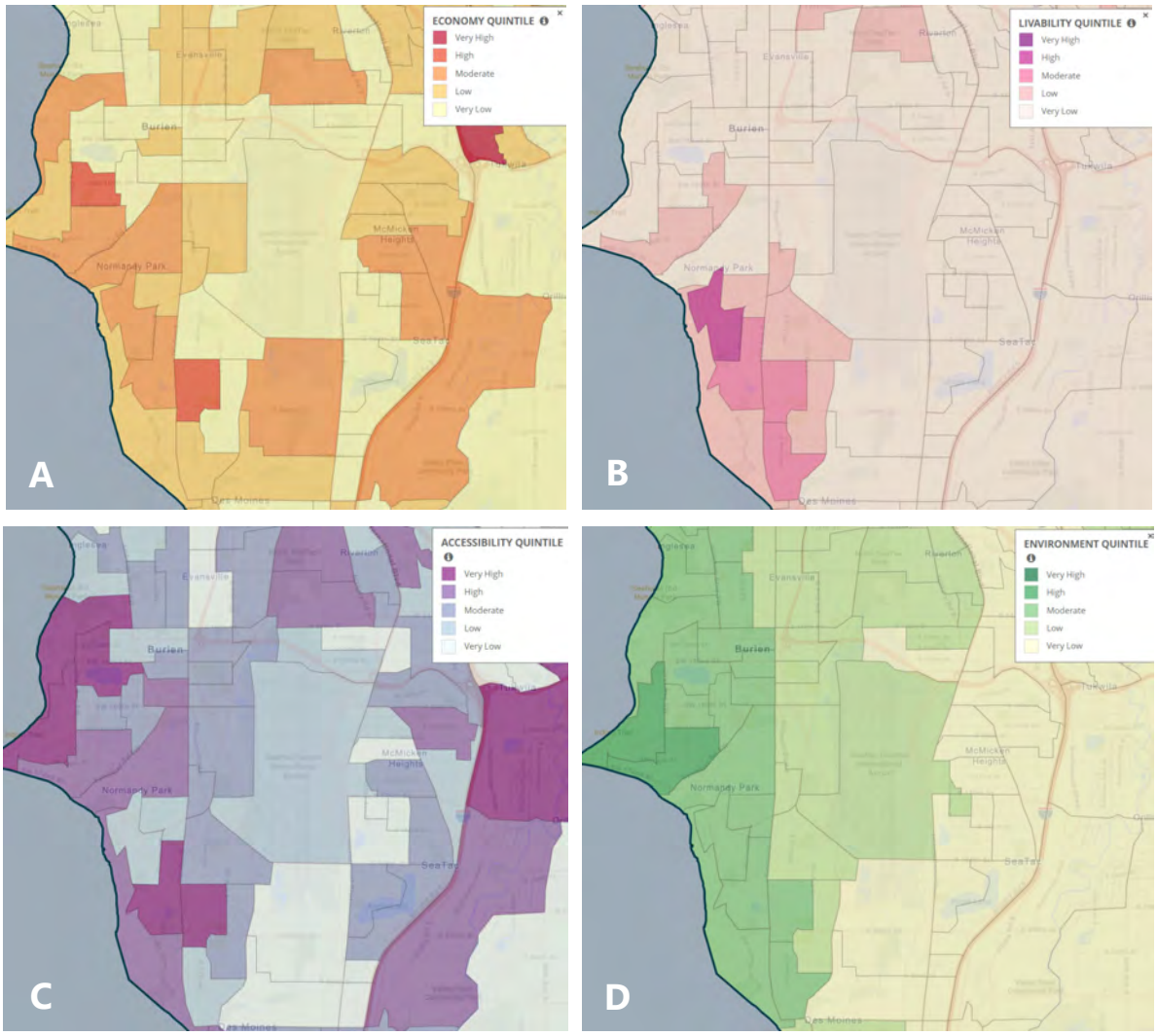
The Port developed an Equity Index as part of the Port's commitment to identify and address inequity and social injustice. The LSP utilizes this information to prioritize land stewardship actions that have the potential to provide equity benefits. The data used to create the Port's Equity Index are available at the census-block resolution, and scores for equity range from very low to very high. Figure 10 shows the equity scores at SEA for each of the four categories that comprise the Equity Index:

- Economy scores range from very low to moderate
- Livability scores are typically very low
- Accessibility scores range from low to high
- Environment scores are low

When combined to create the Equity Index, SEA is located in areas rated as having very low to low equity (Figure 11). Areas identified as having low equity indices are prioritized for stewardship action.

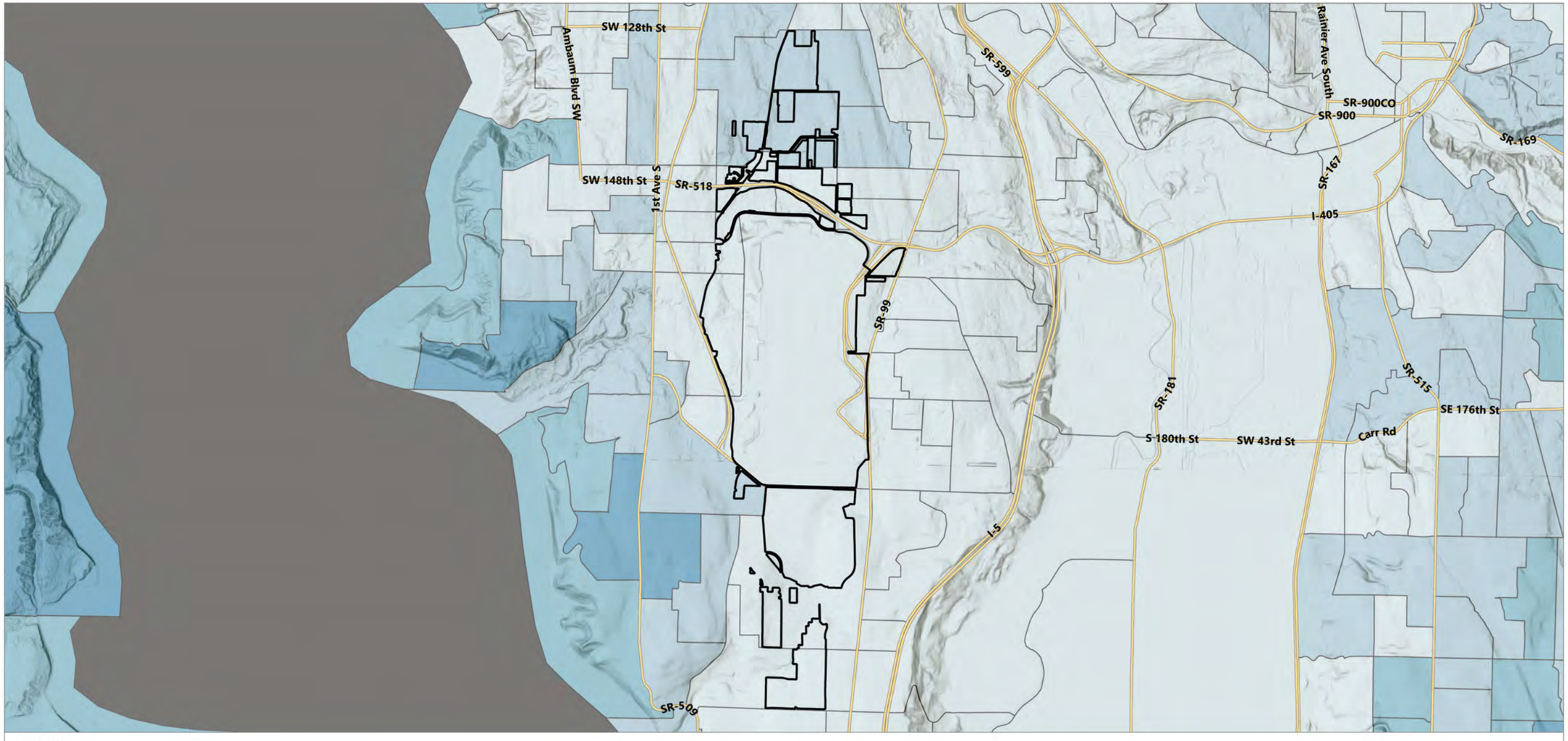
The Port intends to continue developing a more comprehensive Equity Index scoring matrix, of which Environment and Sustainability staff and leaders will be contributors, particularly for the Environment module.

Figure 10
SEA Equity Index Scores for Each Equity Category



Equity Categories
A: Economy
B: Livability
C: Accessibility
D: Environment

Figure 11
SEA Equity Index



3.4.2 Urban Heat Islands

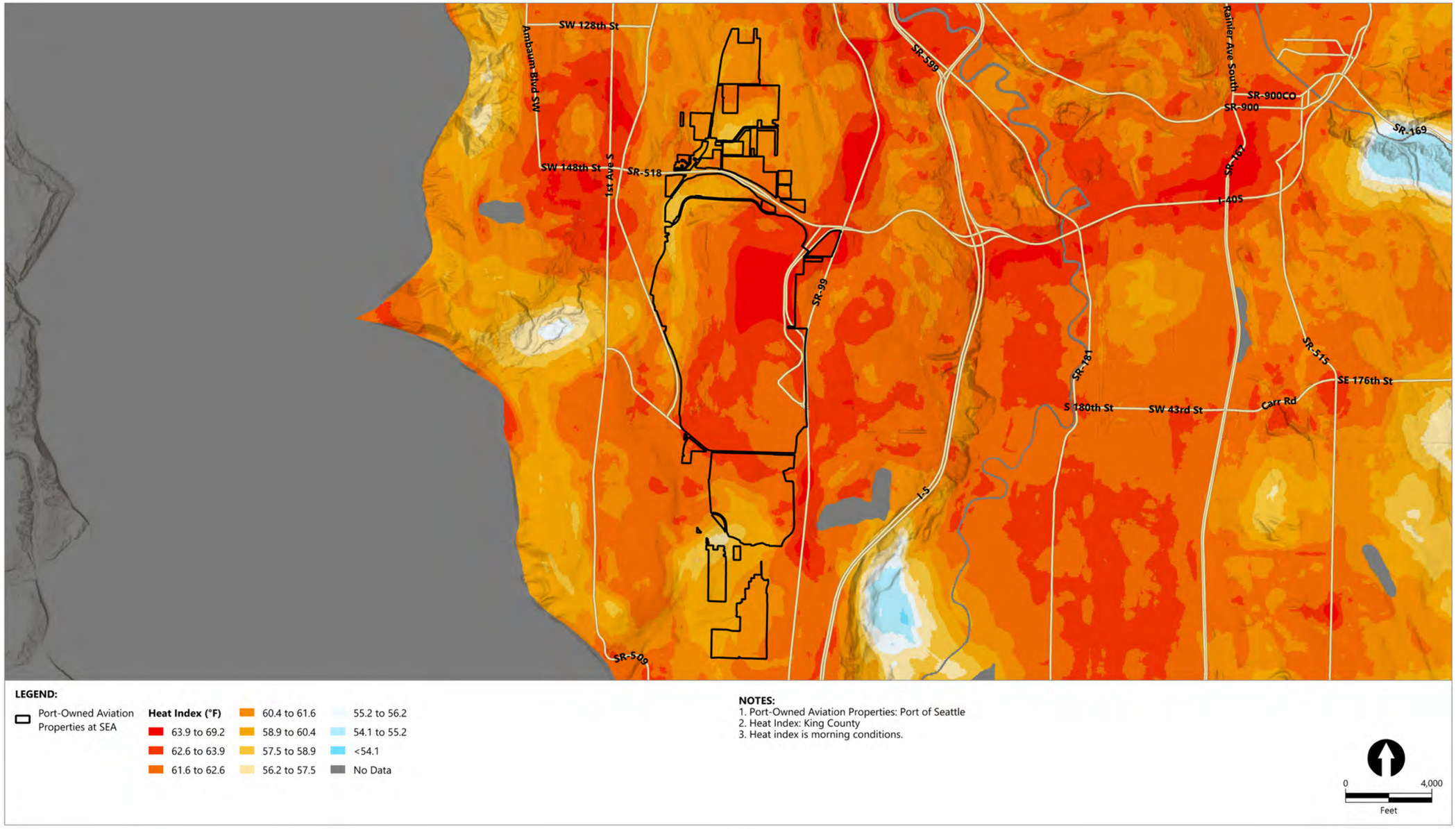
> *The harmful and inequitable impacts of climate change demand both immediate action and structural changes to create more resilient communities. The data from the heat mapping project will help us achieve both.*
>
> - Dow Constantine, King County Executive

In 2021 King County and the City of Seattle conducted the King County Heat Watch mapping project, which provided snapshots in time of how urban heat varies across neighborhoods and how local landscape features affect temperature and humidity. The results showed that areas with more impervious surfaces, limited canopy, and industrial activities are hotter during summer heat waves than other, less urbanized areas (King County 2021c). The King County Heat Watch data were used to produce a heat island map in the SEA vicinity, as shown in Figure 12. The heat index accounts for relative humidity and air temperature, and the heat map represents the morning heat index. Areas with dark oranges and reds represent a higher heat index and areas with yellow and pale orange represent a lower heat index. Trees and other vegetative cover help cool the environment and reduce the urban heat island effect. Therefore, the LSP seeks to prioritize stewardship actions on lands with higher heat indices, particularly in areas that also have low equity scores.

3.4.3 Community Access

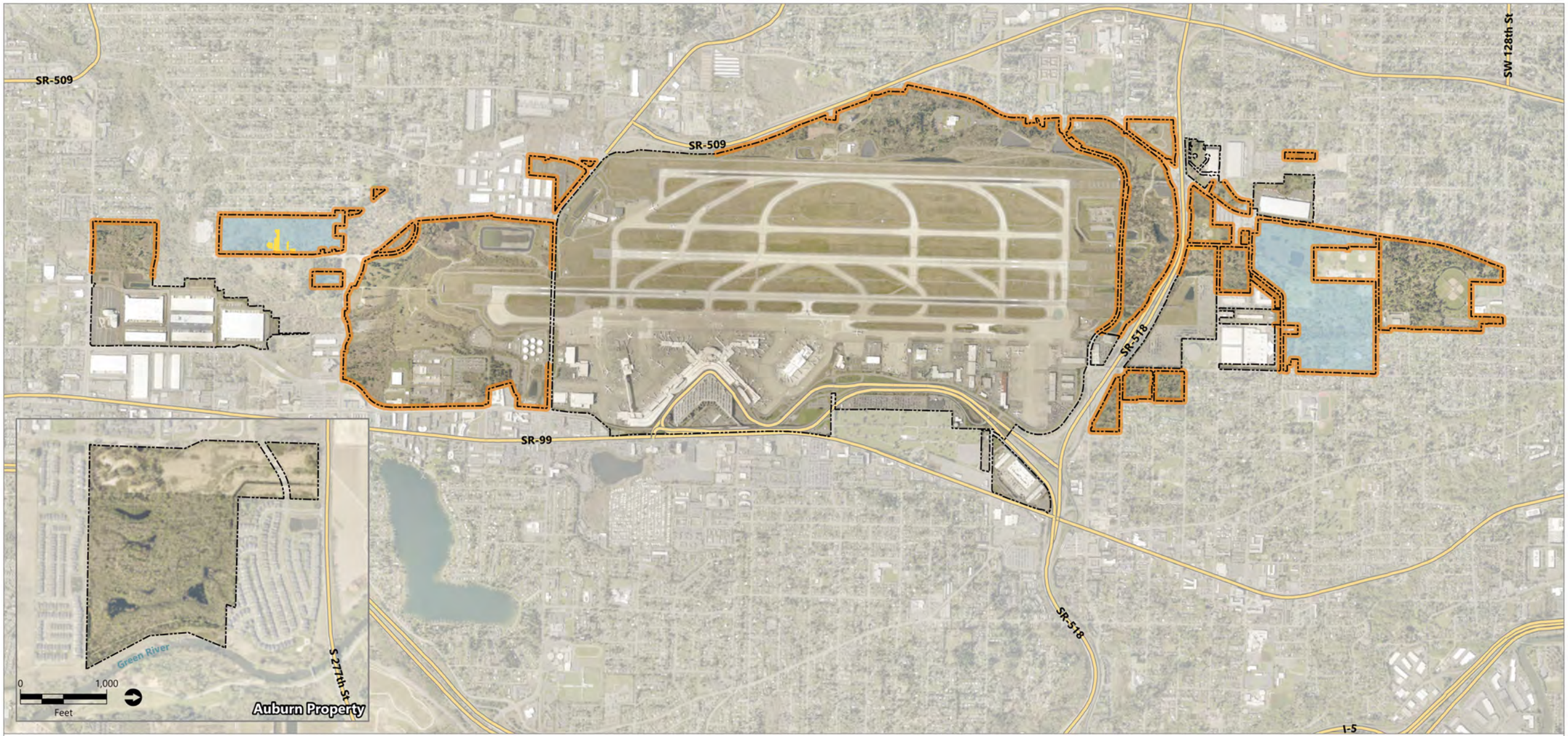
Figure 13 maps the current community benefits areas at SEA including community planting areas, areas with existing physical community access including parks and open space, and Port-owned areas along the Port ownership boundary that are under consideration for LSP actions (sites that do not have operational constraints or private leases) and that necessitate consideration for public visual aesthetics and public safety.

Figure 12
Heat Island Effect



Notes:
1. Data are provided by King County 2023.

Figure 13
Community Benefit Areas



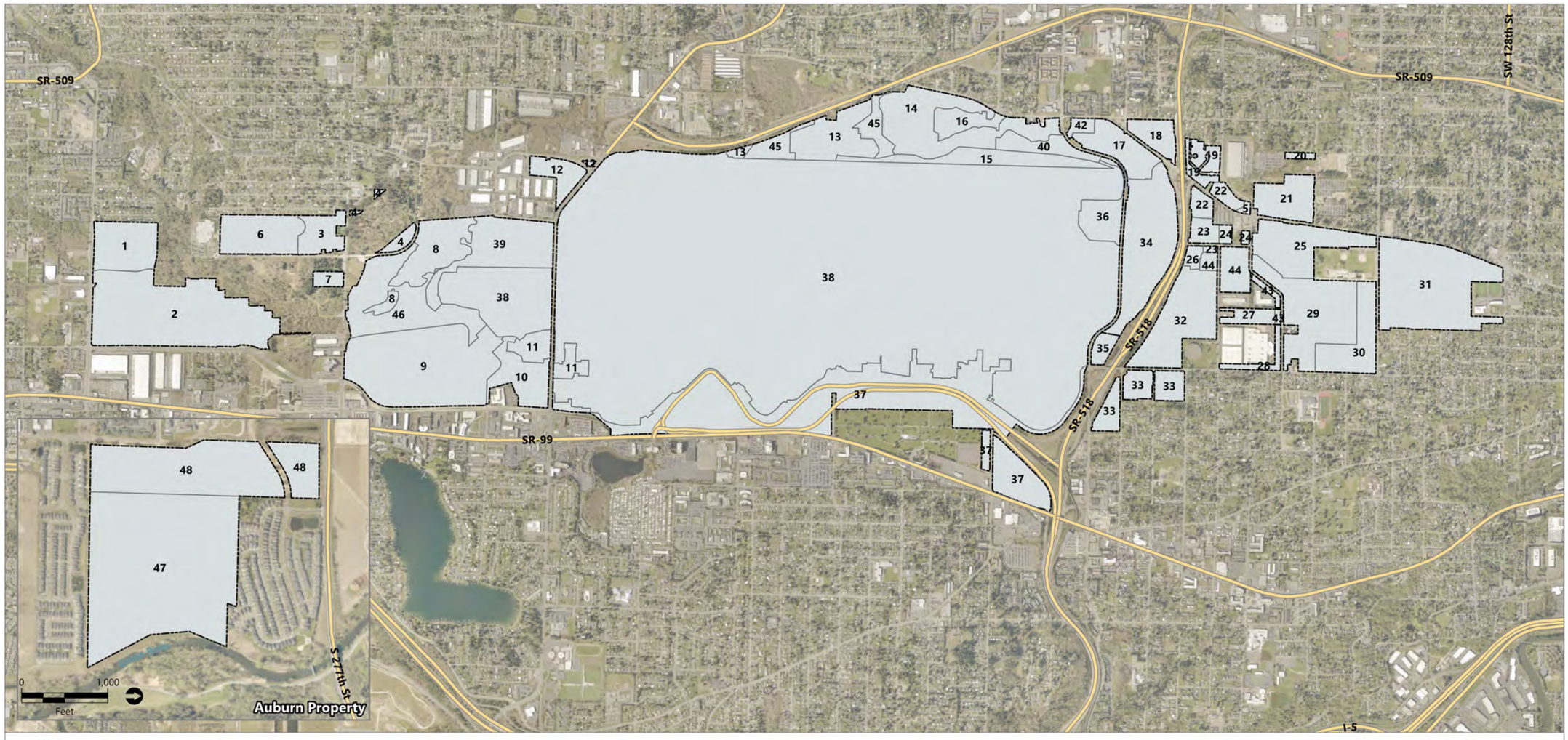
4 Stewardship Recommendations by Management Unit

This section overlays existing and future land use with existing resource conditions to categorically characterize stewardship for each MU. For MUs with high stewardship potential, a more detailed analysis is provided to identify specific stewardship actions, including the potential benefit to communities.

4.1 LSP Recommendations

Figure 14 identifies 48 MUs with distinct resource and planning characteristics for which land stewardship potential was independently assessed, including the two off-site parcels in Auburn purchased by the airport for previous and future mitigation.

Figure 14
LSP Management Units



LSP recommendations for each MU are based on the feasibility of implementation and ecological assessments as described in the methodology section's Figure 1. MUs that are highly constrained by current Port operations are recommended to have No Action taken. MUs that are constrained by current lease agreements or future lease/development are recommended to have Infrastructure and Safety Maintenance. MUs within the existing North SeaTac Park are identified as such, noting that the Port and City of SeaTac are discussing future opportunities in the park. MUs without the restrictions mentioned above may have the potential for Ecological Use. These MUs are then subdivided into three categories: Existing Mitigation, Potential Mitigation, and Habitat Enhancement (Figure 15).

Figure 15
Stewardship Recommendations

Figure 16 maps the LSP recommendations for each MU. Seventeen MUs are highly constrained by operations or leases and are identified as No Action. Nine MUs are constrained by future development and are identified as Infrastructure and Safety Maintenance. Four MUs are within North SeaTac Park. The remaining 20 MUs have potential for Ecological Use for consideration as part of land use planning and identification of site best uses. Table 4 provides a summary of the stewardship recommendations for each MU.

Figure 16
Stewardship Recommendations by Management Unit

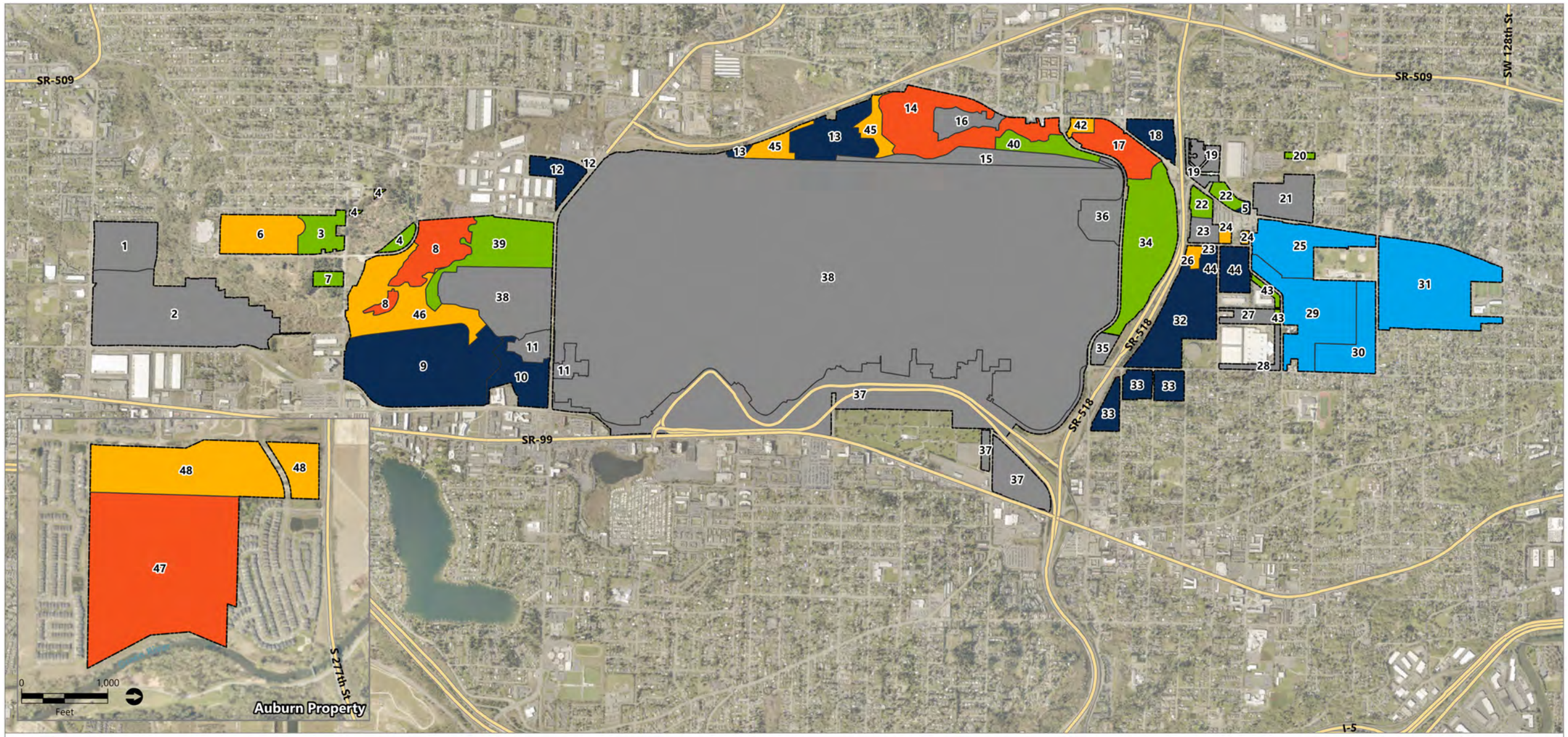


Table 4
LSP Recommendations For Each MU

LSP Recommendation	MU	Site Name
Ecological Use: Existing Mitigation	8	Tyee Golf Course
	14	Miller Creek Buffer Mitigation Area
	17	Vacca Farm/Lora Lake Mitigation Area
	47	Auburn Mitigation Area
Ecological Use: Potential Mitigation	6	Borrow Site Study Area
	24	Miller Creek East
	26	Wetland 2
	42	RST Property
	45	West Side Campus
	46	Tyee Golf Course East
	48	Future Mitigation Bank
Ecological Use: Habitat Enhancement	3	Borrow Site North and P-5
	4	Remnant Parcels
	7	P-4
	20	Zappala
	22	Des Moines Nursery/Williams Mitigation
	34	North of 156th
	39	Tyee and DMC Regional Detention Facility
	40	West of Airport
	43	Boeing Buffer
North SeaTac Park	25	North SeaTac Park
	29	55-acre Parcel
	30	North SeaTac Park – South of S 136th Street
	31	North SeaTac Park – North of S 136th Street
Public Safety and Maintenance	5	Williams Property Development
	9	SASA
	10	North of SASA
	12	34L RPZ
	13	West Side Campus
	18	NERA 1
	32	North Employee Parking Lot
	33	L-Shape Parcel
	44	13-acre Parcel
No Action	1	Future Des Moines Creek Business Park 3
	2	Des Moines Business Park
	11	SeaTac Fuel Facilities, LLC
	15	Third Runway Embankment
	16	FAA/TRACON
	19	NERA 2 and 3
	21	NERA 2
	23	PACWEST Little League
	27	Boeing Company
	28	Boeing Buffer
	35	Flying Food Fare/Sky Chefs, Inc
	36	North of Airfield
	37	Terminal and Airport Entry
	38	Airfield

4.2 Ecological Assessment Results

FLAT assessments and invasive mapping were conducted on MUs identified with the recommendation "Ecological Use: Habitat Enhancement." Table 5 provides a summary of the results.

Table 5
Ecological Assessment Results

MU	Site Name	Acres of Invasive Vegetation	FLAT Category
3	Borrow Site North and P-5	8.2	9
4	Remnant Parcels	See note 1	
7	P-4	1.6	8
20	Zappala	See note 1	
22	Des Moines Nursery/Williams Mitigation	0.5	5
34	North of 156th	3.9	5
39	Tyee and DMC Regional Detention Facility	0.9	5
40	West of Airport	1.1	7
43	Boeing Buffer	3.2	3

Note:

1. Invasive mapping and FLAT assessments have not been conducted.

4.2.1 2023 High-Value Tree Survey

In early 2023, the Port completed its first high-value tree survey. The survey identified high-value trees on MUs 13, 14, 16, 17, 18, 40, 42, and 45. The survey identified and surveyed 408 high-value trees. Of those trees, 269 were identified as high-value trees because their diameter at breast height (DBH) was equal to or greater than 30 inches. The remaining trees were identified as high-value trees because they are a unique species with potential historical, ecological, or aesthetic significance. Of the total 408 surveyed high-value trees, 183 had the presence of invasive species, largely English ivy. Table 6 summarizes the data collected, and the surveyed high-value trees and attributes are maintained within the LSP baseline database.

Table 6
High-Value Tree Counts by Type and Location

High-Value Trees	Quantity
Designation	
Total high-value trees	405
Size	
Trees with DBH at or above 30 inches	271
Trees with DBH between 28 and 30 inches (likely to be at or above 30 inches in less than five years)	46
Other high-value trees (groves; special characteristics)	88
Type	
Native conifers	285
Native deciduous trees	52
Non-native/Ornamental/Other	68
Location	
High-value trees surveyed on Ecological Sites (MUs 14, 17, 40, 42, and 45)	362
High-value trees surveyed on Public Safety and Maintenance Sites (MU 13)	31
High-value trees surveyed on No Action Sites (MU 16)	12
Invasive Threat	
Not threatened	222
Threatened	183

4.3 Site-Based Stewardship Actions

Site maps identifying specific stewardship actions for all MUs, except for those identified as No Action and those within North SeaTac Park, are included in Appendix C. Table 7 provides a summary of the current potential ecological site-based management action on each MU. Table 8 provides a summary of the potential community benefit site-based management action on each MU. Appendix C provides site plans for all MUs.

Table 7
Potential Site-Based Ecological Stewardship Actions

MU	Site Name	Conduct Regulatory Mitigation	Long-Term Stewardship	Retain for Future Regulatory Mitigation	Remove Invasive Vegetation	Plant Trees and Forests	Protect High-Value Trees	Remove Culverts and Daylight Fish Passable Channels
3	Borrow Site North and P-5				●	●	●	
4	Remnant Parcels				●	●	●	
5	Williams Property Development				●		●	
6	Borrow Site			●	●	●	●	
7	P-4				●	●	●	
8	Tyee Golf Course	●		●	●	●	●	
9	SASA				●		●	
10	North of SASA				●		●	
12	34L RPZ				●		●	
13	West Side Campus				●		●	
14	Miller Creek Buffer Mitigation Area		●		●	●	●	●
17	Vacca Farm/Lora Lake Mitigation Area		●		●	●	●	
18	NERA 1				●		●	
20	Zappala				●	●	●	
22	Des Moines Nursery/ Williams Mitigation		●		●	●	●	
24	Miller Creek East			●	●	●	●	
26	Wetland 2 Study Area			●	●	●	●	
33	L-Shape Parcel						●	
34	North of 156th				●	●	●	
39	Tyee and DMC Regional Detention Facility				●	●	●	
40	West of Airport				●	●	●	
42	RST Property			●	●	●	●	
43	Boeing Buffer				●	●	●	
44	13-acre Parcel				●		●	
45	West Side Campus			●	●	●	●	
46	Tyee Golf East			●	●	●	●	●

MU	Site Name	Conduct Regulatory Mitigation	Long-Term Stewardship	Retain for Future Regulatory Mitigation	Remove Invasive Vegetation	Plant Trees and Forests	Protect High-Value Trees	Remove Culverts and Daylight Fish Passable Channels
47	Auburn Mitigation Area		●		●	●	●	
48	Future Mitigation Bank			●	●	●	●	

Table 8
Potential Site-Based Community Benefit Actions on MUs

MU	Site Name	Manage Tree Hazards	Improve Visual Corridors and Aesthetics	Provide Community Access	Maintain Community Planting Sites
3	Borrow Site North and P-5	●	●	●	
4	Remnant Parcels	●	●		
5	Williams Property Development	●	●		
6	Borrow Site	●	●	●	●
7	P-4	●	●	●	
8	Tyee Golf Course	●	●		
9	SASA	●	●		
10	North of SASA	●	●		
12	34L RPZ	●	●		
13	West Side Campus	●	●		
14	Miller Creek Buffer Mitigation Area	●	●		
17	Vacca Farm/Lora Lake Mitigation Area	●	●		
18	NERA 1	●	●		
20	Zappala	●	●		
22	Des Moines Nursery/ Williams Mitigation	●	●	●	
24	Miller Creek East	●	●		

MU	Site Name	Manage Tree Hazards	Improve Visual Corridors and Aesthetics	Provide Community Access	Maintain Community Planting Sites
26	Wetland 2 Study Area	●	●		●
33	L-Shape Parcel	●	●		
34	North of 156th	●	●		
39	Tyee and DMC Regional Detention Facility	●	●		
40	West of Airport	●	●		
42	RST Property	●	●		
43	Boeing Buffer	●	●		
44	13-acre Parcel	●	●		
45	West Side Campus	●	●		
46	Tyee Golf East	●	●		
47	Auburn Mitigation Area	●	●		
48	Future Mitigation Bank	●	●		

4.3.1 Aggregate Stewardship Potential

Based on the LSP recommendations, ecological assessments, and site-based stewardship actions FLAT assessments, the following quantifies the amount of acreage available at SEA for active land stewardship:

- Long-term stewardship at mitigation sites: 140 acres
- Invasive vegetation removal and management: 57 acres
- Tree and forest planting stewardship: 45 acres
- High-value tree protection (surveyed high-value trees threatened by invasive vegetation): 183 trees

North SeaTac Park (214 acres) is not included for stewardship potential. As described in Sections 2 and 3, the park is subject to a City of SeaTac long-term lease.

Credit: Port of Seattle

5 Management Unit Prioritization

To meet LSP goals and inform the Port's decision-making on where to conduct LSP site-based stewardship actions, MUs identified for Ecological Use are prioritized based on the following attributes:

1. Potential to provide community and equity benefits
    a. Mitigate areas with the worst heat island effects
    b. Improve visual aesthetics by enhancing visually accessible areas
    c. Improve public access by enhancing publicly accessible areas
    d. Improve Port Equity Index
2. Potential to provide ecological benefits
    a. Improve and/or expand existing contiguous habitat corridors
    b. Connect existing contiguous habitats
    c. Restore fish passage and stream connectivity by removing culvert and daylighting fish passage

The prioritization does not assess potential regulatory mitigation approaches and does not align potential development sites with potential mitigation sites that have commensurate amount of mitigation potential. The prioritization is a preliminary step in decision-making and would require Port stakeholder outreach and input before final stewardship action decisions are made.

The scoring approach is presented as Step 5 in the LSP methodology (see Section 2) and supported by the ecological and community equity inventory and mapping (Figures 9, 11, and 12 in Section 4). Based on the analysis, MUs 46, 24, 42, and 48 score the highest and best meet the defined attributes to improve both habitat and to benefit the community. Figure 17 maps the MUs by priority score, and Table 9 provides the results of the land stewardship prioritization.

Figure 17
Management Units Priority for Stewardship Actions

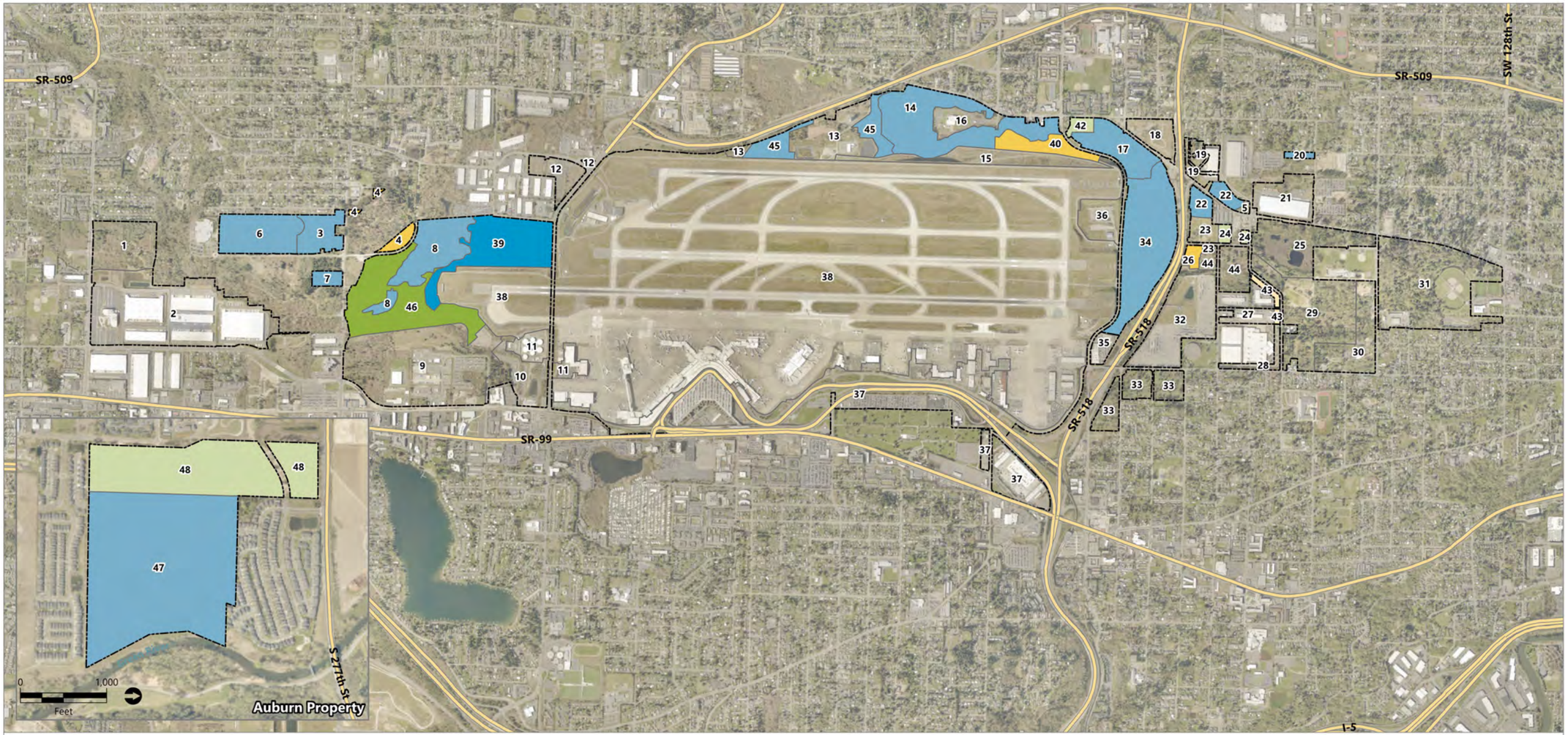
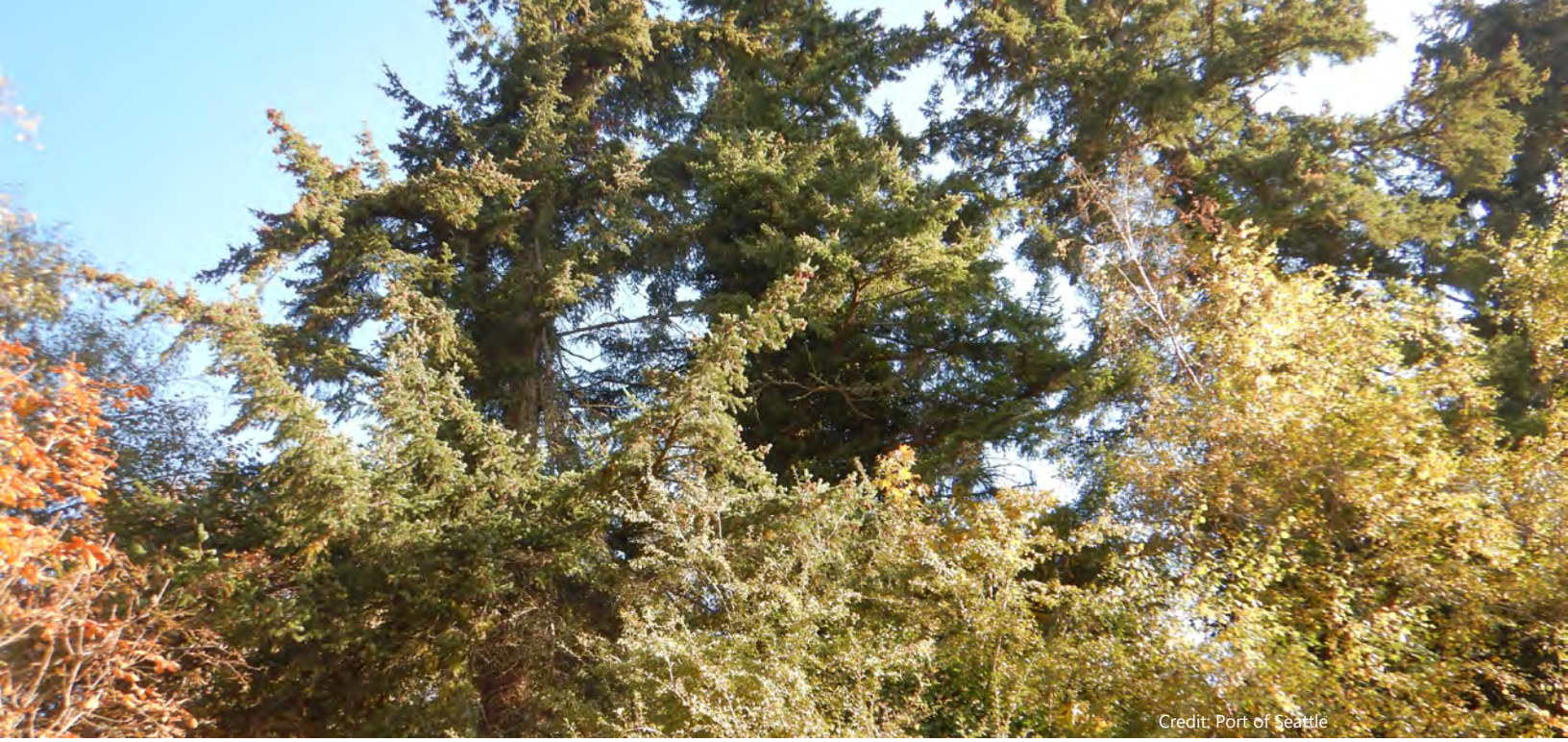


Table 9
Ecological Site Priority Using Equity and Ecological Indicators

MU	Site Name	Reduce Heat Island Effects	Enhance Visually Accessible Areas	Enhance Publicly Accessible Areas	Improve Port Equity Index	Improve and/or Expand a Habitat Corridor	Connect Existing Habitats	Remove Culvert and Daylight Fish Passage	SCORE (Highest to Lowest)
46	Tyee Golf Course East	**1**	**1**	**0**	**1**	**2**	**2**	**2**	**9**
24	Miller Creek East	**0**	**1**	**0**	**1**	**2**	**2**	**0**	**6**
42	RST Property	**0**	**1**	**0**	**1**	**2**	**2**	**0**	**6**
48	Auburn Mitigation Expansion	**1**	**1**	**0**	**1**	**1**	**2**	**0**	**6**
39	Tyee and DMC Regional Detention Facility	**2**	**1**	**0**	**1**	**1**	**0**	**0**	**5**
3	Borrow Site North and P-5	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**4**
6	Borrow Site	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**4**
7	P-4	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**4**
8	Tyee Golf Course	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**4**
14	Miller Creek Mitigation Area	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**4**
17	Miller Creek/Vacca Farm/Lora Lake Mitigation Area	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**4**
20	Zappala	**1**	**1**	**0**	**0**	**2**	**0**	**0**	**4**
22	Des Moines Nursery Mitigation Area	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**4**
34	North of 156th	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**4**
45	West Side Campus	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**4**
47	Auburn Third Runway Mitigation Area	**1**	**1**	**0**	**1**	**1**	**0**	**0**	**4**
4	Remnant Parcels	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**3**
26	Wetland 2 Study Area	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**3**
40	West of Airport	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**3**
43	Boeing Buffer	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**


Credit: Port of Seattle

6 Implementation

In this section, the LSP concludes with a description of how SEA will implement the Land Stewardship Program to meet its stated objectives.

6.1 LSP Implementation

SEA will implement actions intended to achieve LSP objectives and goals according to the schedule for completion and recurrence indicated in Table 10. Many of the actions have already been completed to support and inform development of the LSP or have already been integrated into SEA Environment and Sustainability programs. The following sections describe specific programs and methods for implementing goals and actions.

Objective 1. Establish and maintain an inventory of land stewardship resources.

SEA Environment and Sustainability staff have maintained an inventory of natural resources since 2000, when data began to be collected as part of the 1997 Master Plan Update development activities. Initial inventory items focused primarily on regulated aquatic resources, including wetlands, streams, and their regulatory buffers, as well as other critical areas such as steep slopes and wellhead protection areas.

Staff have archived these spatial data and keep a current record of existing resources as information has become available. This allows timely information to be provided for project planning and permit compliance, and also supports the Port's overall efforts for stewardship as indicated, for example, through compliance with conditions for Salmon Safe Certification.

Recently, additional effort has been made to map existing restoration sites, including compensatory mitigation, voluntary planting, and community stewardship sites. To further support LSP planning and implementation, the Port has recently added land (forest) cover data and is working to add tree inventory data, including high-value trees and tree presence/absence on developed sites. This information will help ensure high-value trees are protected and high-visibility development is actively maintained with maximum canopy consistent with development standards and airport operational requirements.

Regional high-resolution aerial imagery is updated every five years, enabling land cover estimates to be updated on a five-year cycle. The Port will update the LSP land cover data and inventory attributes every five years.

The Port also collected inventory information related to community equity, including urban heat island mapping, mapping visual buffers and public access, and mapping the Port Equity Index. These indicators are used to inform prioritized site selection for stewardship activities.

The Port will release annual updates on LSP goals and progress through the publication of an environmental report and Dashboard. Continuation of active inventory to maintain a living land stewardship database will allow SEA to document change over time and assess achievement of LSP objectives and goals.

Objective 2. Protect and restore healthy and self-sustaining trees, forest, and other habitat.

Objective 2 identifies actions intended to promote overall forest health, including planting trees to increase canopy; replacing invasives with native understory plants to improve forest function, including natural recruitment of trees; and protecting existing high-value trees from invasives threats.

These actions are implemented primarily through annual work plans for site maintenance created by the SEA Environment and Sustainability group and implemented through a range of service providers, including SEA Maintenance crews, conservation crews, and community stewardship events, and Port community grant awardees implementing stewardship projects in partner communities. Stewardship activities are prioritized at sites with the greatest ecological and community equity benefits.

Objective 3. Connect and expand existing habitat.

Objective 3 is primarily a planning exercise to identify and prioritize actions implemented through Objective 2. Sites selected for annual maintenance and community stewardship are consistent with the prioritization evaluation presented in the LSP (see Section 5).

Removing fish passage barriers to connecting streams is achieved on an ad hoc basis through capital infrastructure projects, planning by the Miller Creek and Des Moines Creek Basin Committees (for both of which the Port is a stakeholder and funding contributor), and coordinated past projects such

as the West Fork Miller Creek daylighting and culvert replacement project being constructed in summer/fall 2023.

Objective 4. Offset operational and development impacts to trees, forest, and other habitat.

Offsetting tree-clearing impacts resulting from the impacts of SEA operations and development is accomplished through regulatory compliance and sustainability planning pathways, which are both strategies the Port Commission has directed SEA to implement as part of the Order to implement Environmental Land Stewardship Principles (Port of Seattle 2023b). SEA staff are currently working to develop tree definition, retention, and replacement standards for the Airport Activity Area designated as under Port (SEA) authority in the 2018 Interlocal Agreement with the City of SeaTac (Note: activities within jurisdictions of SeaTac, Des Moines, and Burien are subject to their existing development standards regulated tree clearing). The standards will require cleared trees to be functionally replaced through tree protection, invasive management, and planting to restore healthy forests. Standards and tree replacement projects will be consistent with the Environmental Land Stewardship Principles and planning information provided herein.

In addition, the LSP is supplemented by a Mitigation Opportunities Assessment technical document that identifies and evaluates sites with mitigation potential. This document provides mitigation quantities that can be aligned to project impacts to select sites appropriate for the required amount of mitigation and also provide high-level construction costs that can be used for preliminary project planning.

The Port Sustainability Evaluation Framework is a pseudo-voluntary program applied to Capital projects. The Habitat component of the SEF is intended to implement planning for tree replacement consistent with the Principles and identify additional stewardship activities not directly related to tree replacement, such as material salvage (native plants, woody debris) and alternative habitats for sites where tree planting would not comply with flight safety and other rules and regulations. The SEF Guidance Manual describing how to apply these considerations to project planning is due to be completed in the second quarter of 2024. Part of this planning will include providing LSP site plans specific to the sites on which projects occur.

Objective 5. Support community partnerships.

SEA Environment and Sustainability will work with Environmental Affairs and Environmental Justice staff to coordinate and implement community site stewardship events, other educational and engagement events, and community grant programs. These efforts are all ongoing work that is deeply integrated into existing SEA and Port environmental, public affairs, and equity programs.

SEA leaders will continue to advocate for and support interagency projects and agreements to achieve leveraged outcomes that provide greater or otherwise unachievable environmental outcomes that benefit airport ecological resources and community equity. These projects are

typically ad hoc and opportunistic but can be identified and supported through LSP inventory and mapping information as well as project-based work. Examples of current interagency partnerships include the North SeaTac Park lease agreement with the City of SeaTac and the 2023 City of Burien project to daylight the West Fork Miller Creek and improve fish passage under Des Moines Memorial Boulevard. This project was the outcome of the joint Port-Burien Northeast Redevelopment Area planning area agreements. The Port contributed the land for the stream daylighting and, along with the City of SeaTac, contributed funds, without which the project could not have been accomplished.

Table 10
LSP Objectives, Goals, Supporting Actions, and Implementation Timeline

Goal	Action	Implementation Timeline
LSP Objective 1. Establish and maintain an inventory of land stewardship resources.		
Establish benchmark conditions	• Inventory, map, and assess the condition of trees, forest, and other habitat attributes: - Landscape conditions (land cover; land use) - Site-specific conditions (forest health; high-value trees; trees on developed sites) o Regulated aquatic resources o Streams, wetlands, and their regulatory buffers o Other environmentally critical areas o Individual trees (high-value mature trees and trees on developed parcels) - Contiguous habitat (stream riparian corridors; stream culverts and fish passage) • Inventory, map, and assess community equity attributes of surrounding neighborhoods	Initial benchmarking complete Complete one-time inventory of individual trees by 2025. Establish new benchmarks every five years
Maintain a living land stewardship geodatabase	• Conduct periodic land cover analysis, forest health assessments, and tree inventories to assess change in tree canopy and forest health • Update resource database for tree inventories, aquatic resource delineations, and contiguous habitat as it becomes available	Every five years Ongoing
Track achievements	• Document tree protection, tree planting, and invasive removal on SEA property • Document tree planting and invasive removal projects sponsored by the Port community equity initiatives in surrounding communities • Inventory and document SEA tree canopy and forest health • Report achievements for tree protection, tree planting, and invasive removal/understory planting in the annual environment and sustainability scorecard • Document tree protection, tree planting, and invasive removal on SEA property	Annual Annual Annual Annual Every five years
LSP Objective 2. Protect and restore healthy and self-sustaining trees, forest, and other habitat.		
Implement tree planting to increase canopy and habitat function	• Plant 500 trees (two acres) annually to augment canopy and diversity	Annual
Restore invasive areas to a native forested condition	• Implement invasive species maintenance for 20 acres of property • Plant one acre of native understory shrubs and ground cover annually to increase forest structure and diversity • Protect 50 mature trees from invasive threats annually to maintain their function and value • Create an index of prioritized sites using ecological and equity metrics	Annual Annual Annual Complete

Goal	Action	Implementation Timeline
LSP Objective 3. Connect and expand existing habitat.		
Connect and expand contiguous habitat	• Prioritize stewardship at sites in or contiguous to existing habitat corridors • Coordinate and support community projects within mapped contiguous habitat corridors	Complete Ongoing
Enhance stream longitudinal connectivity to allow salmon migration	• Replace stream culverts and other artificial barriers with fish-passable structures	As possible
LSP Objective 4. Offset operational and development impacts to trees, forest, and other habitat.		
Integrate environmental stewardship into capital development processes	• Establish SEA development standards for trees, including tree definition, on-site retention, and replacement requirements • Develop and implement the Habitat and Restoration criteria of the Sustainable Evaluation Framework	End of 2023 Update SEF Guidance Manual by Quarter 2 of 2024; Project-based implementation
Programmatically plan and implement compensatory stream and wetland mitigation	• Complete a mitigation opportunities assessment identifying sites with potential for future compensatory stream, wetland, and tree mitigation • Include the Port's Equity Index scoring, public accessibility, and heat island information as part of Land Stewardship site management plans	Complete Complete
Identify actions with the greatest community equity benefit	• Prioritize in-basin projects for stream and wetland compensatory mitigation • Prioritize sites that provide a buffer between airport operational and development and adjacent neighborhoods • Prioritize sites according to urban heat island and the Port's Equity Index scores • Conduct public engagement on projects with tree, forest, and other habitat mitigation requirements	Complete Complete Complete Complete
Implement land stewardship practices in the existing built environment	• Replace missing, dead, and unhealthy trees in landscaped areas at existing development sites in accordance with project as-built designs and current landscaping standards • Mitigate public safety hazards	End of 2025 Annual

Goal	Action	Implementation Timeline
LSP Objective 5. Support Community Partnerships.		
Provide community engagement opportunities through the Land Stewardship program	• Establish community stewardship sites on airport property	Annual
	• Conduct community events (planting and/or maintenance)	Annual
	• Integrate job training and workforce development opportunities	Annual
	• Maintain planted sites for a five-year period	Annual
Support Port community equity Initiatives	• Coordinate with South King County Development Fund grant program	Annual
	• Participate in Green Cities Partnership	Complete
	• Provide public engagement opportunities to inform stewardship planning and activities	Ongoing
	• Include Equity Index scores as part of site-specific resource assessments and management recommendations	Complete
Leverage interagency partnerships	• Facilitate and enable to the extent feasible stewardship projects sponsored by the SEA public partners	As possible
	• Utilize grant funding opportunities provided by federal and state equity and/or tree stewardship initiatives	As possible

6.2 Conclusion

While the results of the LSP analysis demonstrate that multiple operational activities and future development plans constrain ecological opportunities on Port-owned aviation lands, there are lands with ecological potential at SEA and the Port can achieve specific ecological goals at SEA. Of the 2,768 acres assessed (this includes the Port's Auburn property), 1,763 acres were identified as too heavily encumbered by current Port operations and development activities. A total of 284 acres are encumbered by potential future development, and 214 acres are located within North SeaTac Park, which is leased, operated, and maintained by the City of SeaTac. However, through the LSP feasibility and ecological assessment, appropriate actions have been identified on the remaining 507 acres at SEA located in ecological areas.

Stewardship activities both protect existing site infrastructure and promote opportunities to support the Port integrating the 2023 Environmental Land Stewardship Principles. The following provides snapshots on how this can unfold:

Manage mitigation sites beyond compliance timeline

Miller Creek Mitigation Area's (MU 14) mitigation restrictive covenant restricts any future development on the site and requires the Port to monitor and maintain the site until it meets its mitigation plan requirements. The Port has met those requirements and does not have a regulatory requirement to continue monitoring the site. However, the LSP identifies that the mitigation covenant, including its 48 acres of forested area, should be maintained beyond the regulatory mitigation monitoring requirements. In addition, the LSP MU 14 site plan has identified an opportunity to improve fish passage and connectivity by replacing an existing culvert and expanding the mitigation area. The LSP MU 14 site plan has also identified fringe areas adjacent to the mitigation covenant area that offer potential for habitat improvement and expansion. These LSP actions could convert lower-functioning grass and shrub habitat to forest, expanding forest cover by 12 acres.

The port's Auburn mitigation site

Emergent marsh at third runway mitigation site

Expand invasive species management

The West Side Campus (MU 13) is directly west of the AOA. This area is instrumental for SEA operations and has future development plans. While the MU does not provide great opportunities for LSP actions to enhance, expand, or connect habitat, there is an opportunity to reduce invasive

vegetation cover. As shown in the MU 13 site plan, 16 acres of the MU is dominated by Himalayan blackberry and Scot's broom. Invasive vegetation is spread through wind dispersion and wildlife to the adjacent AOA where it competes with the highly regulated and maintained grass vegetation planted along the runways. Managing the invasive vegetation on MU 13 would reduce maintenance requirements within the AOA.

Initiate restoration projects

MU 42 is surrounded by the SEA's Vacca Farm/Lora Lake Mitigation Area and offers potential for wetland enhancement and re-establishment. The MU is dominated by an impervious parking area and mowed grass. A narrow-forested area runs along Miller Creek. Restoring the MU could enhance and re-establish more than two acres of forested wetland and increase the MU's forest cover by more than three acres.

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Appendix A
Mitigation Site Opportunity Assessment

May 2019
Land Stewardship Plan: Appendix A

Port of Seattle

Mitigation Site Opportunity Assessment

Prepared for the Port of Seattle
P.O. Box 68727
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May 2019
Land Stewardship Plan: Appendix A

Mitigation Site Opportunity Assessment

Prepared for
Port of Seattle

Prepared by
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TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

ABBREVIATIONS

Airport	Seattle Tacoma International Airport
Ecology	Washington State Department of Ecology
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FAA	Federal Aviation Administration
HUC	Hydrologic Unit Code
ILF	in-lieu fee
IRT	Interagency Review Team
LSP	Land Stewardship Plan
MPU	Master Plan Update Improvement Projects
MU	Management Unit
PEM	palustrine emergent
PFO	palustrine forested
Port	Port of Seattle
PSS	palustrine scrub shrub
RM	River Mile
WAC	Washington Administrative Code
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

1 Introduction

The Port of Seattle (Port) owns approximately 2,700 acres of land that support the operation of the Seattle-Tacoma International Airport (Airport). Many of these properties will be developed in the future to accommodate increased demand for airport support facilities and other operations and commercial development. These lands also provide habitat for many of the region's valued fish and wildlife species, including wetlands, streams, floodplains, riparian areas, and associated buffers. The Port is developing the Land Stewardship Plan (LSP) for the Airport in a manner that considers plans for growth and development. The LSP will guide decision-making by describing the Airport's baseline condition, then defining, locating, and prioritizing stewardship actions.

The Port is reviewing existing aviation properties to evaluate mitigation potential, with the goal of maximizing wetland and habitat functions in the watersheds in and around the Airport and the larger Green/Duwamish River and nearshore watersheds (Water Resource Inventory Area [WRIA] 9), while supporting area development. This aligns with the Port's Century Agenda mission to advance commerce and promote industrial growth in an environmentally responsible way.

This appendix evaluates wetland and buffer mitigation opportunities on aviation Management Units (MUs) defined in the LSP that already contain wetlands and associated buffers. Each of the MUs assessed in this appendix has some potential to mitigate for unavoidable impacts through wetland and buffer restoration, establishment (creation), enhancement, and/or preservation. Many of the MUs provide opportunities to improve wetland functions, either as concurrent or advanced mitigation to offset aviation development impacts.

This appendix describes the background and rationale for this evaluation (Section 2), an overview of watershed-level functions in WRIA 9 that should be prioritized with any mitigation action (Section 3), and an evaluation of wetland and buffer mitigation opportunities for several aviation MUs (Section 4). Because of the potential for wetland establishment, size, and proximity to the Port's adjacent wetland mitigation site, MU 45 in Auburn has the potential to be included in an umbrella mitigation bank, which is being proposed in coordination with the Port's Maritime Division. Section 5 provides information to evaluate the Auburn Site Study Area for inclusion in the mitigation bank, such as background information regarding the goals of a mitigation bank, a project need analysis, an assessment of the market conditions for a bank, and the steps and schedule for establishing an umbrella mitigation bank.

2 Background and Overview

Development and operations of the Port and other businesses often directly or indirectly affect aquatic environments or sensitive areas. Pursuant to federal, state, and local regulations, these impacts are avoided and minimized to the extent possible but often require compensatory mitigation to replace wetland and/or fish and wildlife habitat functions when unavoidable impacts occur. However, finding space and funds to perform such mitigation is a challenge near the Airport and in the Green River valley. As a major landowner, the Port is in a unique position to select and dedicate sites for mitigation.

The Port of Seattle's Mission

The Port is a special-purpose municipal corporation serving King County with a mission "to create good jobs here and across the state by advancing trade and commerce, promoting manufacturing and maritime growth, and stimulating economic development." The Port is committed to responsibly stewarding public resources and the environment and partnering with surrounding communities, while promoting social responsibility, transparency, and accountability. The Port owns and manages many properties and seeks to maximize public assets in the portfolio, with an eye toward best uses and environmental sustainability (Port of Seattle 2018a).

The Port has the option to conduct voluntary wetland and/or habitat restoration to improve wetland and/or fish and wildlife habitat functions on Port property. Voluntary actions would not be triggered by any specific development action, but would be identified by the Port as part of the LSP or other restoration initiative for properties that have the opportunity to improve important watershed or habitat functions.

The Port may also be required to conduct compensatory mitigation to offset unavoidable impacts to wetland and/or fish and wildlife habitat on Port property. Compensatory mitigation could be implemented as advance mitigation or concurrent mitigation. Advance mitigation would generate credits to provide future compensatory mitigation for permitted impacts that have yet to be identified. Most mitigation projects require at least 10 years to achieve performance standards and reach full function (Ecology 2012a). Therefore, advance mitigation usually generates more credits than concurrent mitigation by decreasing temporal loss (i.e., impacts to wetland or habitat will occur in the future). Concurrent mitigation is implemented within 1 year of impacts, but generates fewer credits than advance mitigation sites because temporal loss and the risk of failure at the site is higher (Ecology 2012b). Credits earned through advance mitigation can only be used by the permittee (i.e., Port), and cannot be sold to another applicant (Ecology 2012a).

As another option, in recent years, Ports and other public organizations have chosen to sponsor mitigation banks to maximize wetland and habitat functions in a more predictable manner, while also achieving a more efficient permit process for development projects. Several Washington ports have recently sponsored wetland mitigation banks (Port of Vancouver), habitat conservation banks (Port of Everett), or umbrella wetland and habitat conservation mitigation banks (Port of Tacoma). An umbrella mitigation bank may include multiple sites deemed appropriate and approved by the Interagency Review Team (IRT), which is an interagency group of federal, state, tribal, and local

regulatory and resource agencies. Different sites often provide different functions under the umbrella bank. As such, credits from a Port-sponsored umbrella mitigation bank could potentially be used by the Port, Port tenants, business owners, and government agencies to mitigate for aquatic and wetland impacts as well as impacts to Endangered Species Act (ESA)-listed species, Essential Fish Habitat (EFH), and other state- and federally protected species and habitat.

3 Watershed Context

The Airport and the surrounding areas are within WRIA 9 (Figure 1). WRIA 9 includes the Nearshore subwatershed (Hydrologic Unit Code [HUC] 171100190204) of Miller Creek, Walker Creek, Des Moines Creek, and other small drainages that drain portions of the cities of SeaTac, Burien, Normandy Park, and Des Moines directly to Puget Sound. The Lower Green River subwatershed (HUC 1711001303) includes the portion of the Green River from Auburn at River Mile (RM) 30 through Kent, Renton, and Tukwila to RM 11, just upstream of the historical confluence with the Black River. Immediately downstream of the Lower Green River subwatershed is the Duwamish Estuary subwatershed, which extends to RM 0 at Elliott Bay.

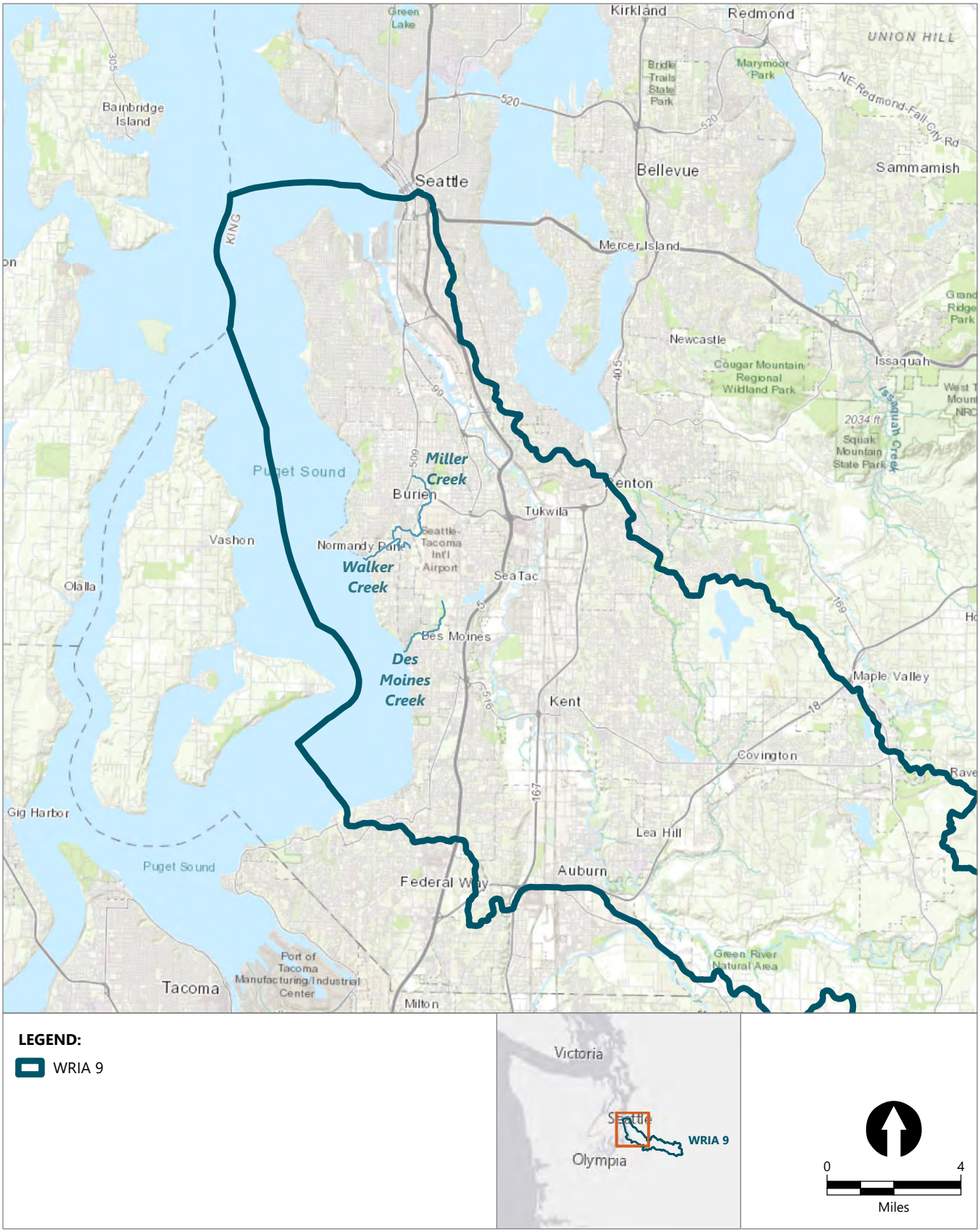
3.1 Nearshore Subwatershed

The Nearshore subwatershed in the vicinity of the Airport has been altered as a result of development over many decades. Land use in the subwatershed consists primarily of residential and industrial uses, which has resulted in changes in water quality, riparian vegetation, and sedimentation in nearshore habitat. Salmon populations in the region have decreased over time, as evidenced by the ESA listings of Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss*), and bull trout (*Salvelinus confluentus*), which were historically present, along with other salmon, in Miller, Walker, and Des Moines creeks.

Published in 2001, the comprehensive State of the Nearshore Ecosystem Reconnaissance Assessment recognized the importance of restoration and protection of critical ecosystem functions in the nearshore environment, providing recommendations that included wetland enhancement and preservation, protection of undeveloped shoreline habitat, and restoration of modified land, starting in the Duwamish River estuary and subestuaries (Starkes 2001). Shoreline armoring in the nearshore subwatershed has also been a continuing issue for salmon habitat restoration, with more armoring built than removed through restoration between 2005 and 2014 (Higgins 2014).

3.1.1 Miller and Walker Creeks

Extensive flooding and erosion in the Miller and Walker Creeks Basin prompted an analysis of current and future conditions in the basin, presented in The *Miller and Walker Creeks Basin Plan* (Amoto and The Resource Group Consultants 2006). Development and impacts associated with human activities in the basin have increased impervious surface and reduced fish habitat in stream systems. Land cover in the basin is primarily residential or commercial, with the Airport at the eastern end. There is a lack of riparian habitat, leading to high flows which increases erosion and damages stream beds. In 1999, assessments of Miller and Walker Creeks found a high pre-spawn mortality of salmon (Amoto and The Resource Group Consultants 2006); stormwater discharge and low water quality in the streams may be the cause of low biological health. The basin plan identifies the goal of habitat protection and improvement to increase anadromous fish populations.



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ANCHOR QEA

Figure 1
Vicinity Map
Mitigation Site Opportunity Assessment
Land Stewardship Plan: Appendix A

3.1.2 Des Moines Creek

In 1997, the Des Moines Creek Basin Committee developed the *Des Moines Creek Basin Plan* to address stream-related issues and make recommendations for infrastructure investments. High flows, erosion, fish passage barriers, and water quality limit fish productivity in this basin (Des Moines Creek Basin Committee 1997). Hydrologic management installed at key locations, like detention and bypass systems to reduce flow, was the primary outcome of this plan. The plan also recommended improving riparian and instream habitat, such as rehabilitating riparian zones by removing invasive plants and improving riparian buffers.

3.2 Lower Green River Subwatershed

The Green/Duwamish watershed provides important feeding, spawning, and migratory habitat to native fish and wildlife. Anadromous salmon found in the Green/Duwamish watershed include Chinook, coho (*Oncorhynchus kisutch*), chum (*O. keta*), sockeye (*O. nerka*), and pink (*O. gorbuscha*) salmon, as well as steelhead, cutthroat (*O. clarkia*), and bull trout (Northwest Indian Fisheries Commission and WDFW 2015). Among these species, federally threatened species include Puget Sound Chinook salmon (Federal Register, 2 August 1999 and 28 June 2005), Puget Sound steelhead (Federal Register, 11 May 2007), and Coastal-Puget bull trout (Federal Register, 1 November 1999). Critical habitat is designated and includes Puget Sound and the Green/Duwamish River for Chinook salmon (Federal Register, 2 September 2005) and bull trout (Federal Register, 18 October 2010). Critical habitat was proposed for steelhead, but has not yet been designated (Federal Register, 14 January 2013). EFH is designated under the Magnuson-Stevens Fisheries Conservation and Management Act for Pacific Coast salmon, which encompasses Chinook, coho, and pink salmon (Federal Register, 15 October 2008).

Fall-run Chinook, coho, fall-run chum, sockeye, and pink (odd year) salmon, along with coastal cutthroat, winter- and summer-run steelhead, and bull trout have been documented in the Lower Green River subwatershed. Pools in the upper portions of the Lower Green River may provide spatial separation from aquatic predators that reside in deeper waters, improved protection from predators through higher turbidity levels, and improved foraging capacity for juvenile salmonids (Anchor 2004). Adult salmon primarily spawn in the middle reaches of the Green River and its tributaries. The use of different habitats along the Green/Duwamish River varies with seasonal timing and life stage of Chinook salmon (Ruggerone et al. 2006); this suggests that a diversity of habitats along the estuarine gradient is important to support a diversity of juvenile life history strategies, which contributes to population resilience.

After the federal government listed Puget Sound Chinook salmon, steelhead, and bull trout as threatened, local governments in the Green/Duwamish watershed created the Salmon Habitat Plan (WRIA 9 Steering Committee 2005), which acts as a guide for protection and restoration actions to

enhance Chinook salmon and bull trout habitat. The Salmon Habitat Plan outlines factors that have led to population decline and habitat enhancement actions that could increase Chinook salmon and bull trout populations; it mentions reduced channel complexity, loss of riparian vegetation, disconnection with off-channel habitat, reduced sediment supply, and low water levels as widespread factors of species decline in this watershed. Many areas along the Lower Green River are affected by levees and revetments, which led to channelization and disconnection of off-channel habitat. Protecting and restoring off-channel habitat, increasing habitat complexity, reconnecting sediment sources to the river, and improving fish passage would have beneficial effects on this watershed.

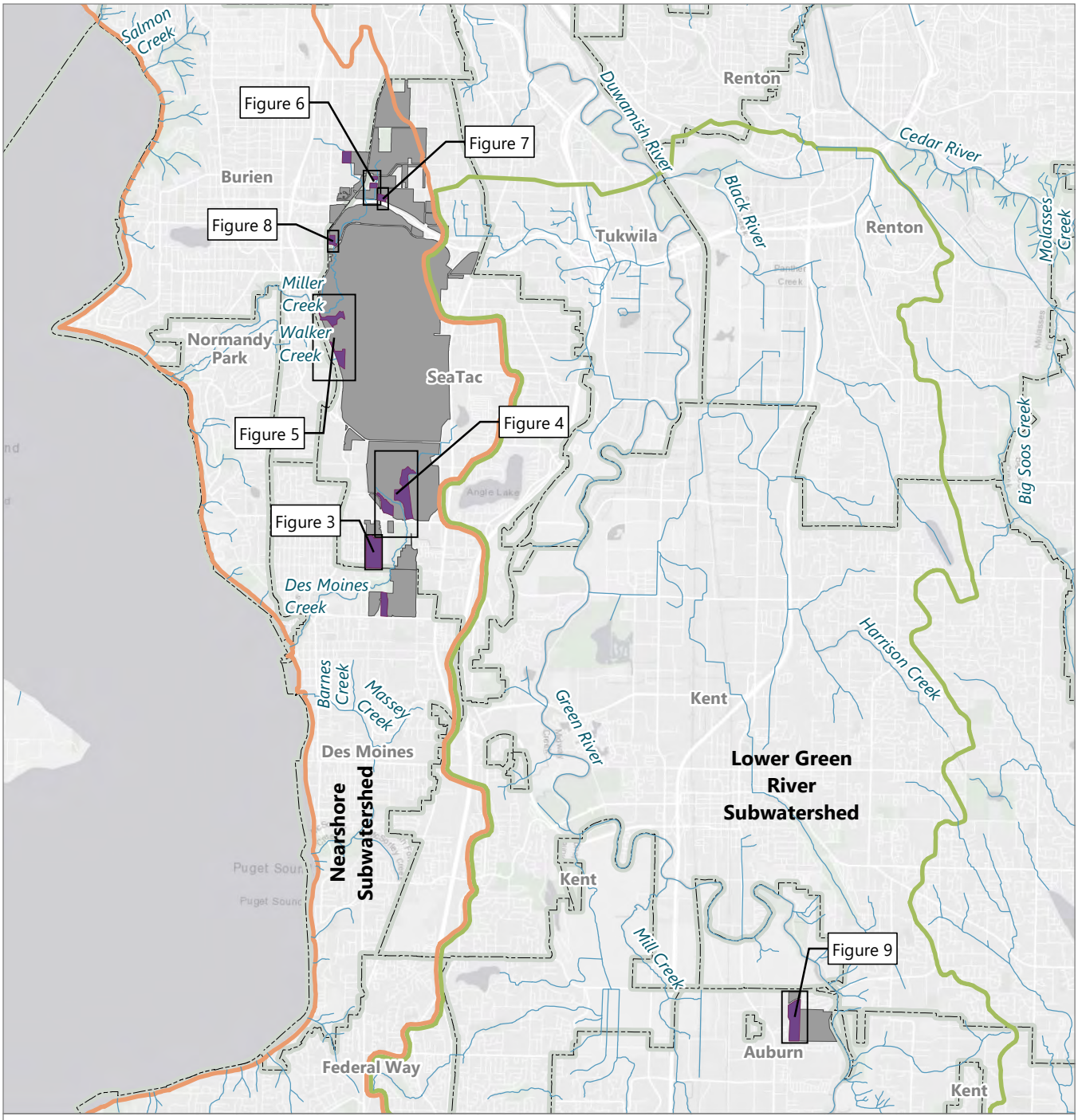
Restoring riparian habitat can improve impaired watershed processes in the Lower Green River subwatershed. Creating or restoring wetlands and associated buffers would improve water quality, improve habitat connectivity for other species dependent on riparian, marsh, and other aquatic environments; and, if adjacent to the Green River, could provide off-channel rearing and refuge for juvenile salmonids.

4 Aviation Wetland and Buffer Mitigation Opportunities

The Port has identified MUs within and adjacent to the Airport containing wetlands that may have the potential for wetland and buffer mitigation, considering their current operational and land use, location, and potential aviation development and expansion plans (Figure 2). Each MU was reviewed to evaluate the potential to restore key watershed functions as part of restoration activities. Some MUs evaluated in this section are large enough to support viable, self-sustaining habitat, but others provide site-scale habitat functions on a smaller scale, considering their position in the landscape.

Section 4.1 evaluates restoration potential for each site, considering existing conditions and constraints. A conceptual restoration plan within each MU was developed, as summarized in Table 1. Section 4.2 provides additional details for the Auburn Site Study Area, which is being proposed for inclusion in the umbrella mitigation bank in coordination with the Maritime Division because of the potential for wetland establishment, size, and proximity to the Port's adjacent wetland mitigation site. Attachment A contains a conceptual-level opinion of probable costs for each MU.

Credits were calculated for each MU using the 2012 Washington State Department of Ecology (Ecology) *Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington* report (Ecology 2012b). Credit calculations are calculated using two methods: concurrent mitigation and advanced mitigation. To qualify for advanced mitigation, construction must be completed and demonstrate some level of success prior to the release of credits for a later project. For advanced mitigation, it is assumed that temporal losses will be reduced. Concurrent mitigation assumes the mitigation activity will be conducted at the same time as the project impact, and, therefore, the number of credits generated from an MU will be less because of temporal loss. Credits calculated through this method estimate the gains in functions and values resulting from mitigation, intended to compensate for impacts to losses of functions and values, known as debits or "acre-points."



LEGEND:

- Map Extent
- Potential Mitigation Sites
- Port Ownership Boundary
- Lower Green River Subwatershed
- Nearshore Subwatershed
- Rivers and Streams

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Miles

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Figure 2
Potential Mitigation Sites Overview
Mitigation Site Opportunity Assessment
Land Stewardship Plan: Appendix A

Table 1
Summary of Mitigation Opportunities

Characteristic	MU 6 Borrow Site Study Area	MU 24 Miller Creek East Study Area	MU 26 Wetland 2 Study Area	MU 45 West Side Campus Study Area	MU 42 RST Property Study Area	MU 46 Tyee Golf Course Study Area	MU 48 Auburn Site Study Area
Size (acres)	31	10.2	3.5	20	3.8	56.9	34
Municipality	City of SeaTac	City of SeaTac	City of SeaTac	City of SeaTac	City of SeaTac	City of SeaTac	City of Auburn
Zoning	Aviation Commercial	Aviation Commercial; Industrial	Aviation Operations	Aviation Operations; Aviation Commercial	Community Business; Aviation Commercial	Aviation Operations	Open Space
Parcels	8962000060; 7687201115; 7687200585; 7687200505; 7687201035; 8962000055; 8962000005; 7687200955; 7687200425; 3822600050	2023049233; 2023049001; 2023049002; 2823049016	2823049016	2923049478; 2923049101; 3846600005	2023049110; 2023049234; 2023049229; 2023049125	2823049016	9360600260; 9360600258; 0004200006
Existing Land Use	Protected wetland and buffer; Flight Corridor Safety Program	Wetlands	Wetlands; access road	Protected wetland and buffer; Flight Corridor Safety Program	Gravel roadway; parking; wetlands	Voluntary protection/ enhancement/ restoration; mitigation	Protected wetland buffers; formerly agriculture
Potential Historical Fill Present	-	-	-	-	Fill associated with parking and road development	Historically a golf course	-
Size of Existing Wetlands (acres)	2.35	0.2	0.2	4.5	1	2	8.3
Size of Existing Buffers (acres)	19.5	2.7	2.8	15	1.7	29.5	8.3
Wetland Rating[1]	II-III	III	IV	III	II	II-III	III
Required Buffer Width (feet)	40 – 225	40 – 225	40 – 225	40 – 225	40 – 225	40 – 225	25 – 200
Wetland Re-Establishment (acres)	0	5.1	0	0	1.1	22	14.8
Wetland Enhancement (acres)	0	0.18	0.23	0	1	1.6	8.1
Wetland Preservation (acres)	2.35	0	0.47	4.55	0	0.4	0
Buffer Enhancement/Preservation (acres)	24.9	5.4	2.82	15	1.65	19.5	10.7
Opinion of Probable Costs[2]	$5M to $6M	$6M to $7M	$1M to $2M	$3M to $4M	$1M to $2M	$28M to $29M	$18M to $19M
Improving Water Quality (acre-points)	1.0575	26.644	0.2849	1.365	7.3704	129.57	107.6
Hydrologic (acre-points)	1.0575	26.644	0.1175	1.365	7.2791	129.57	126.4
Habitat (acre-points)	13.684	28.669	6.0773	9.0925	6.9766	107.5525	118.28
Total Credits Created (advanced)	**15.8**	**82.0**	**6.5**	**11.8**	**21.6**	**366.7**	**352.3**
Improving Water Quality (acre-points)	1.0575	21.386	0.2	1.365	5.9	104.7	91.866
Hydrologic (acre-points)	1.0575	21.386	0.1	1.365	5.9	104.7	109.58
Habitat (acre-points)	13.684	23.561	6.0	9.0925	5.8	89.7	105.26
Total Credits Created (concurrent)	**15.8**	**66.3**	**6.4**	**11.8**	**17.6**	**299.0**	**306.706**

Notes:
1. Wetland rating per Ecology (Ecology 2014)
2. Opinion of probable costs reflect a rough order of magnitude cost based on a conceptual restoration plan without any detailed design evaluation.

4.1 Aviation Property Sites

4.1.1 MU 6: Borrow Site Study Area

MU 6 (Figure 3) is in the city of SeaTac, northwest of the intersection of 18th Avenue South and South 208th Street. The MU is approximately 31 acres and is zoned as Aviation Commercial. More than 70% of the site is wetland or wetland buffer because of the seven existing wetlands on the site. The site is 1,000 feet north of Des Moines Creek in an area with significant vegetative cover and a high potential for groundwater recharge and infiltration.

A portion of the MU along the western edge and within a portion of the buffer for Wetland 29 has been designated as a Flight Corridor Safety Program (FCSP) mitigation site and is planted with native trees and shrubs. The small remaining area of the MU without encumbrances by wetlands, buffers, or FCSP mitigation site areas has limited development potential.

All the wetlands are Category II wetlands with a moderate habitat score and a 165-foot buffer, except for the 960-square-foot Wetland B10, a Category III wetland with a lower habitat score and shorter buffer. These palustrine forested (PFO) and palustrine scrub shrub (PSS) wetlands are already well functioning, densely vegetated habitats with a deciduous vegetation and limited invasive species cover.

Because of the high presence of functioning native mature forest, there is little opportunity for wetland mitigation. The wetland buffer and adjacent uplands is dominated by mature Douglas fir (*Pseudotsuga menziesii*). However, the uplands contain considerable invasive vegetation, including English ivy (*Hedera helix*) and Himalayan blackberry (*Rubus armeniacus*), which provides opportunity to improve and expand the habitat function of the wetland buffer by removing the invasive vegetation and replacing it with native vegetation.

The conceptual restoration design includes wetland preservation and forested buffer enhancement. The buffer enhancement would include invasive species removal and native vegetation establishment. The native tree canopy would remain intact to the maximum extent feasible. The MU would be protected as part of a conservation easement, and ongoing maintenance and monitoring of the buffer and wetland would be required. The total cost of this project is estimated between 5 and 6 million dollars for 16 mitigation credits that could be used to offset wetland impacts, likely from small-scale projects.

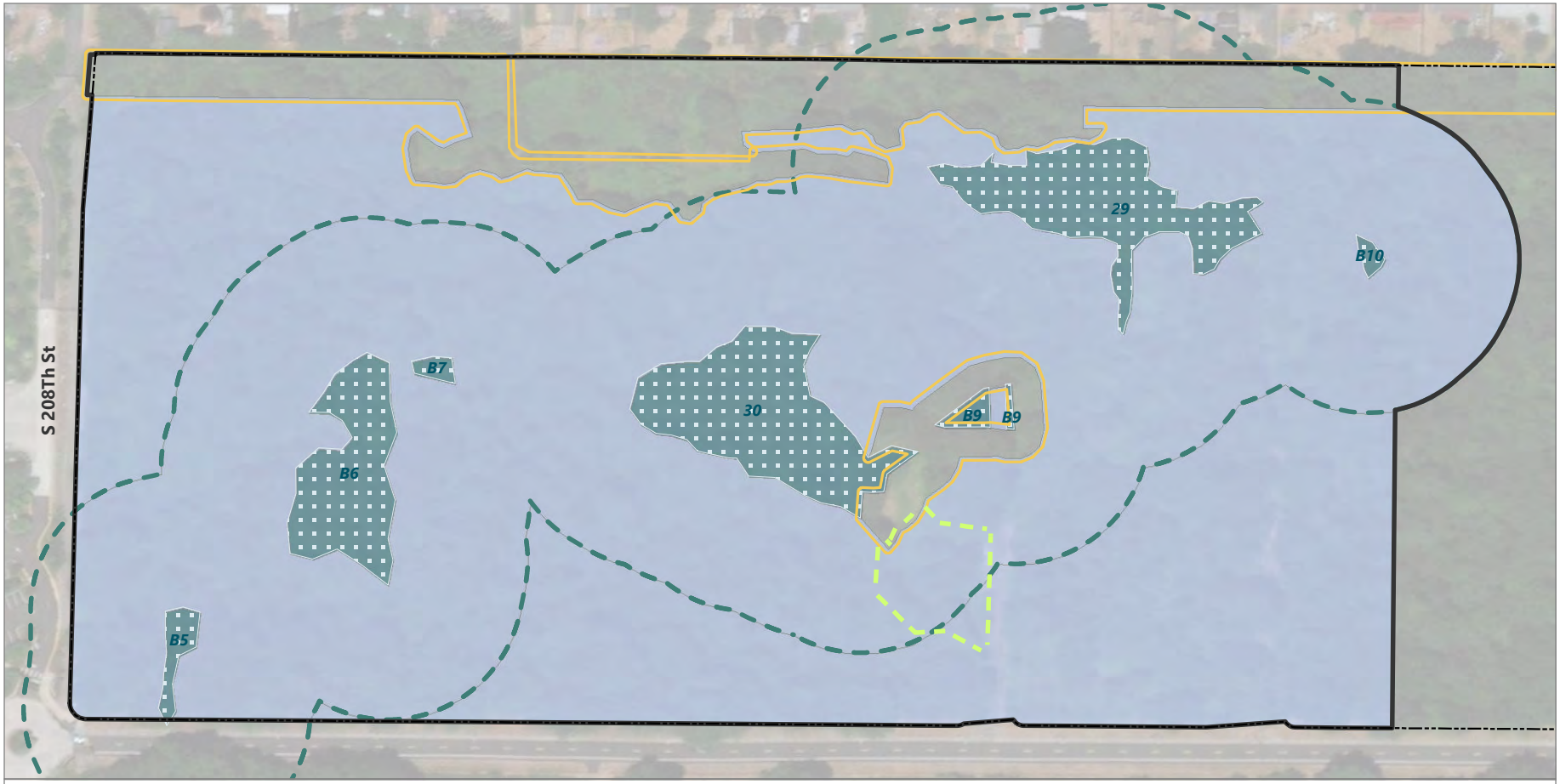

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Figure 3
MU 6: Borrow Site Study Area
Mitigation Site Opportunity Assessment
Land Stewardship Plan: Appendix A

4.1.2 MU 24: Miller Creek East Study Area

MU 24 (Figure 4), the Miller Creek East Study Area, is in the city of SeaTac, west of 16th Avenue South and just south of its intersection with South 144th Street. This study area consists of two Port-owned parcels (MU 24) and includes the eastern portion of parcel 2023049001, currently owned by For Our Future LLC, which is shown as a potential acquisition in Figure 4. The portion of the non-Port-owned parcel that is proposed for mitigation is a delineated wetland with no current development, proposed for preservation. A parking area and warehouse associated with the Commercial Fence Corporation are present within that same parcel, but west of the proposed mitigation area. The northern section of the MU is zoned Aviation Commercial, and the southern portion is zoned Industrial. Four baseball fields are present on the southern section of the MU, which is currently used by PacWest Little League Baseball and Softball.

Miller Creek East flows through the eastern half of the MU, entering from the north and running along 16th Avenue South in a ditch until it enters the site's wetland. The creek then continues south where it enters a culvert under the baseball fields until it daylights and turns west just north of Highway 528.

Wetland N2a is within the non-Port owned parcel and Wetland N2b is within the southern Port-owned parcel. Both are associated with Miller Creek East and are Category III PFO and PSS wetlands with 105-foot buffers. The wetland buffers have considerable invasive cover, in particular the buffer area in the south portion of the MU. The area south of Wetland N2b presents a considerable opportunity to re-establish wetlands up to the baseball fields (across from the intersection of South 146th Street), and possibly, as part of a more substantial restoration scenario over the entire area of the baseball fields, which would eliminate the baseball fields.

Buffer enhancement would include invasive species removal and native vegetation establishment. Wetland re-establishment would involve excavation and installation of native vegetation. Wetland re-establishment north of the baseball fields may be the most likely restoration scenario, considering the importance of the baseball fields, which would provide substantial lift to existing habitat conditions and watershed function (and would not require elimination of the baseball fields). This scenario, consisting of wetland re-establishment, wetland enhancement, and buffer enhancement on the MU north of the baseball fields, would generate approximately 28 advanced mitigation credits, 24 concurrent mitigation credits, and cost between 2 and 3 million dollars. Enhancements to the entire MU, as shown on Figure 4 and presented in Table 1, would cost between 6 and 7 million dollars for approximately 82 advanced mitigation credits, or 66 concurrent mitigation credits. Costs for land acquisition are not included. This work would be protected as part of a conservation easement, and ongoing maintenance and monitoring of the buffer and wetland would be required.

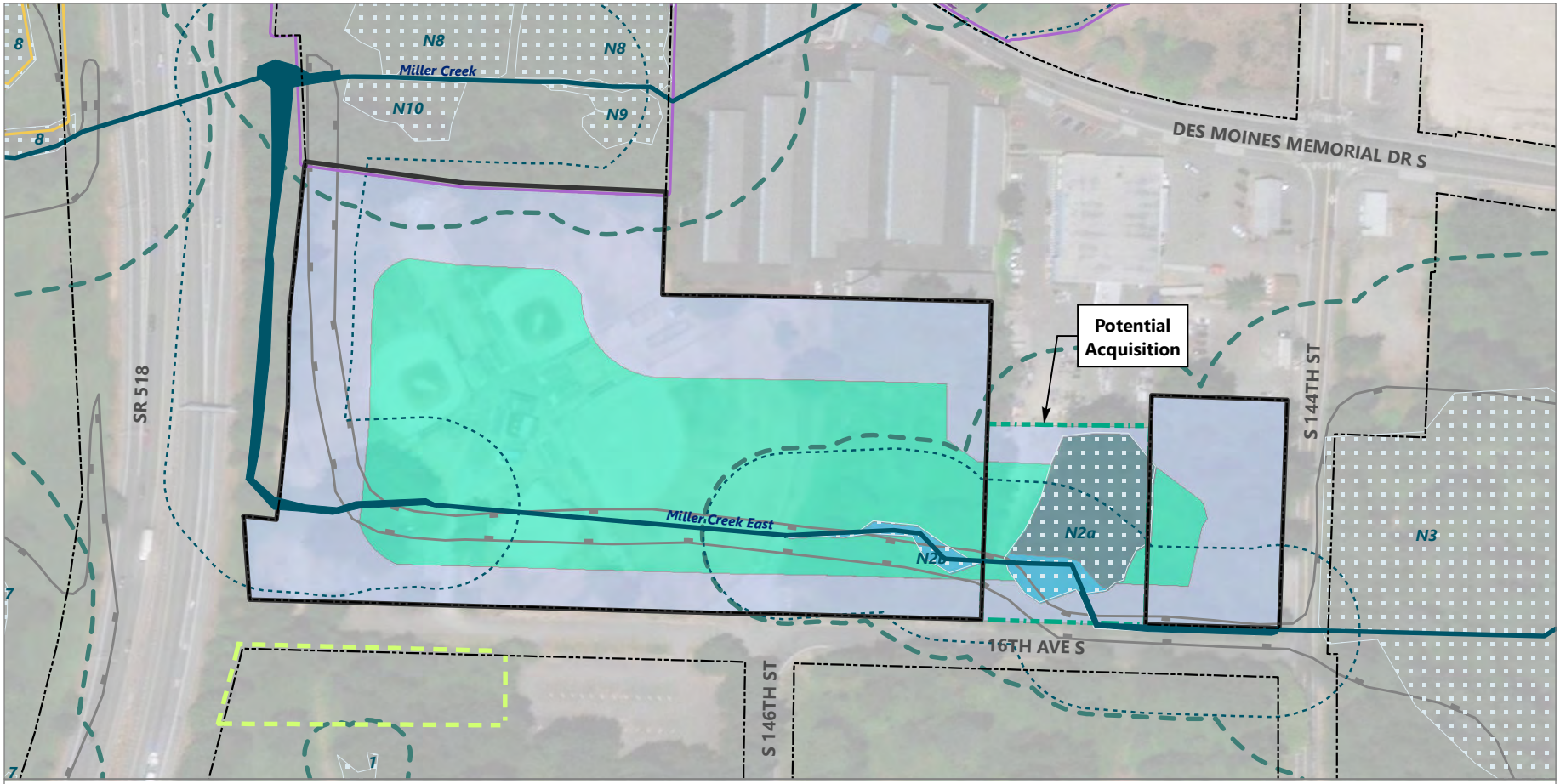

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Figure 4
MU 24: Miller Creek East Study Area
Mitigation Site Opportunity Assessment
Land Stewardship Plan: Appendix A

4.1.4 MU 26: Wetland 2 Study Area

MU 26 (Figure 5), the Wetland 2 Study Area, is in the city of SeaTac, north of SR 518 and southeast of the intersection of South 146th Street and 16th Avenue South. The 3.5-acre MU consists of five parcels and is primarily zoned as Aviation Operations. MU 26 is in the Miller Creek drainage. Miller Creek East flows approximately 165 feet west of the MU.

Two wetlands have been delineated within the MU, and both are Category IV PFO and PSS wetlands with low habitat scores and 40-foot buffers. Just east of the MU is a gravel maintenance access road for the runway lift safety tower. A portion of the wetlands are impacted by invasive vegetation including Himalayan blackberry and have limited canopy and understory native vegetation. These areas have the opportunity for wetland enhancement through removal of invasive vegetation and installation of native plants (Figure 5), while other portions of the wetlands have potential for preservation. Wetland buffer enhancement in the form of invasive removal and installation of native plants also presents a large portion of this MU, up to and including the community planting area along the western portion of the site.

The total cost of this project is estimated between 1 and 2 million dollars for 6.5 advanced mitigation credits or 6.4 concurrent mitigation credits, which could be used to offset a small wetland impact.

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Figure 5
MU 26: Wetland 2 Study Area
Mitigation Site Opportunity Assessment
Land Stewardship Plan: Appendix A

4.1.5 MU 42: RST Property Study Area

MU 42 (Figure 6), the RST Property Study Area, is northeast of the intersection of Des Moines Memorial Drive South and South 156th Way in the city of SeaTac. The MU consists of five parcels. It is 3.8 acres and is primarily zoned as Community Business, with a small portion zoned Aviation Commercial.

Miller Creek enters the southeastern portion of the MU from the adjacent parcel, runs through the site and enters a culvert beneath South 156th Way, and continues off site to the south and west.

The existing wetland (Wetland A1) within the MU is hydrologically connected to wetlands within a restrictive covenant that are part of the previously constructed Miller Creek Mitigation Area adjacent to MU 42 on the south and east boundaries (Figure 6). Miller Creek runs through the property at the southeast corner of the MU. The portion of Wetland A1 that is within the MU is in poor condition and heavily impacted by invasive vegetation, resulting in a moderate habitat score. The buffer is also heavily impacted by invasive vegetation and development. The gravel roadway and parking area substantially restrict vegetative cover, which are largely co-located in the 100-year floodplain. Wetland expansion and buffer enhancement is the primary opportunity on this MU, which would eliminate use of this property for parking.

The conceptual restoration design proposes to re-establish 1.11 acres of PFO, PSS, and palustrine emergent (PEM) wetland and enhance the existing 1 acre of PFO, PSS, and PEM wetland. Buffer enhancement would include invasive species removal and native vegetation establishment. The total cost of this project is estimated between 1 and 2 million dollars for approximately 22 advanced mitigation credits or 18 concurrent mitigation credits.

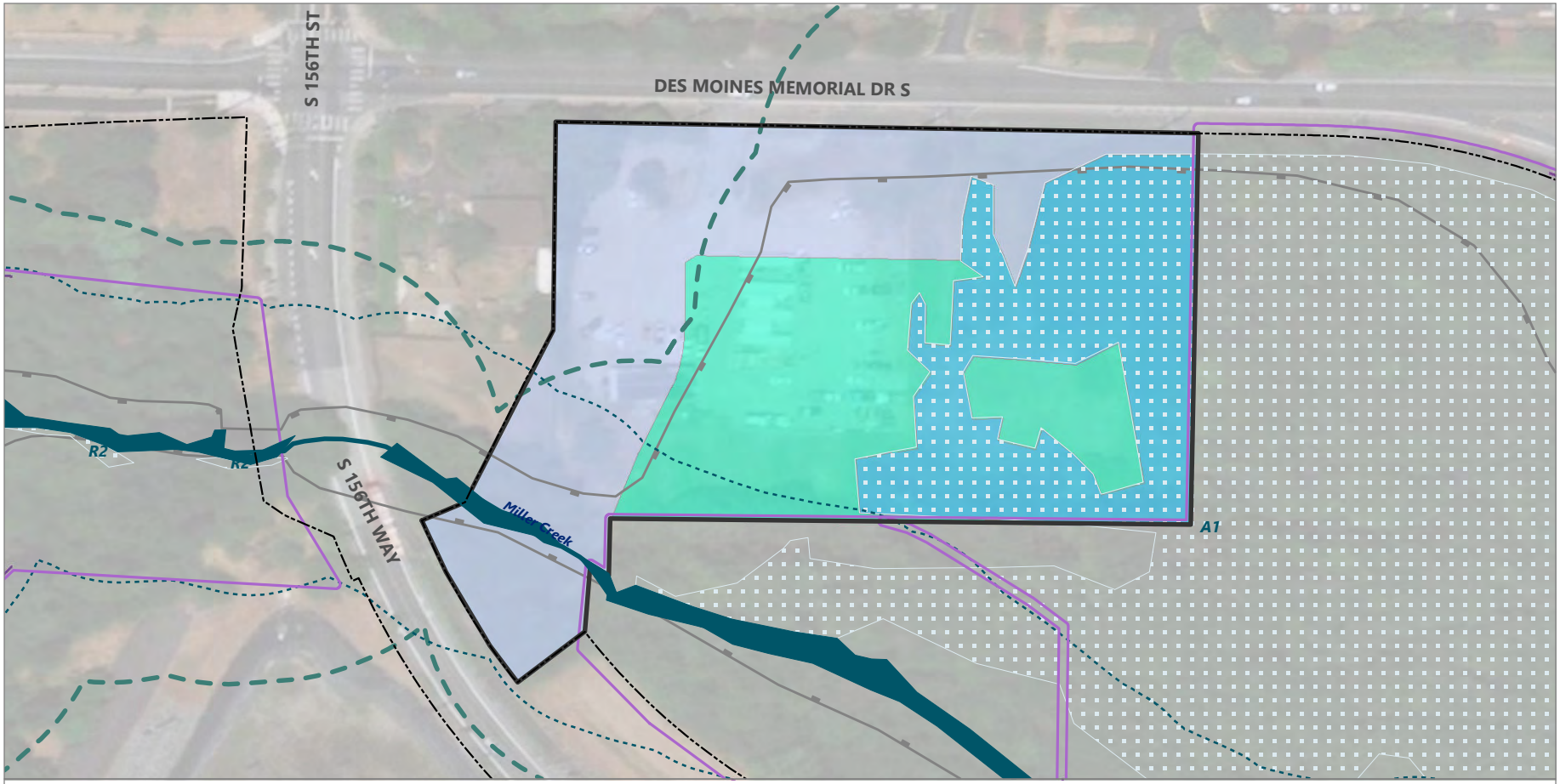

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Figure 6
MU 42: RST Property Study Area
Mitigation Site Opportunity Assessment
Land Stewardship Plan: Appendix A

4.1.7 MU 45: West Side Campus Study Area

MU 45 (Figure 7) is the Port's 20-acre West Side Campus, west of the Airport, adjacent to WA-509. Future development is proposed in the central portion of the MU, mitigation is not considered for this area at this time. Outside of planned development areas, mitigation opportunities are present on the northernmost and southernmost portions of the MU (19.7 acres). This MU is zoned within the city of SeaTac as Aviation Operations (southern portion) and Avian Commercial (northern portion). Parts of Miller Creek flow through the wetlands at the north end of the MU.

The wetlands in the northern and southern portions are all PSS and PFO wetlands with a deciduous canopy and minimal invasive vegetation cover. These wetlands are all Category II or III wetlands with moderate habitat scores. Wetland preservation is recommended to minimize disturbance to existing mature native forested vegetation. Because the wetland buffer has limited canopy cover, much of which is dominated by invasive vegetation like Scot's broom (*Cytisus scoparius*) and Himalayan blackberry, removing invasive vegetation and replacing it with native vegetation will substantially improve function.

The conceptual restoration design includes preservation of the existing wetlands and buffer enhancement through the removal of invasive species. Proposed development is likely to require averaging to reduce the standard 150-foot buffer widths in some places, but this MU provides opportunities to widen and enhance buffers in other areas within the MU. The total cost of this project is estimated between 3 and 4 million dollars for approximately 12 mitigation credits.

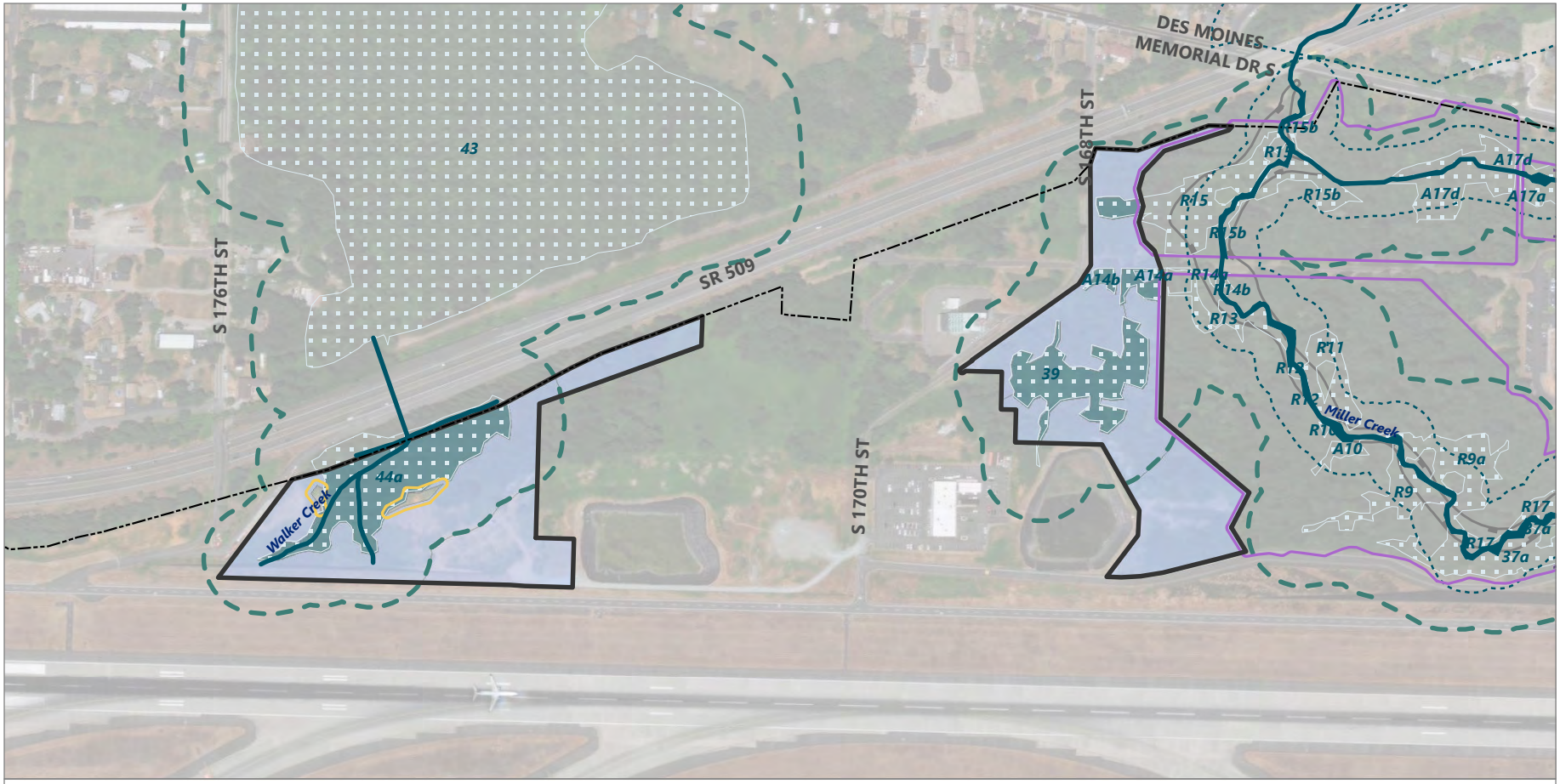

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Figure 7
MU 45: West Side Campus Study Area
Mitigation Site Opportunity Assessment
Land Stewardship Plan: Appendix A

4.1.8 MU 46: Tyee Golf Course Study Area

MU 46 (Figure 8), part of the former Tyee Golf Course, is at the southern tip of the Airport, north of South 200th Street, and encompasses approximately 57 acres. The MU is zoned as Aviation Operations, and it is within the city of SeaTac. The site is within the Runway Safety Area, where development is restricted. Potential for restoration at the site is high because of the large area with limited existing constraints.

MU 8 contains 10 small wetlands with potential for expansion adjacent to Des Moines Creek's western and eastern tributaries. All the wetlands are rated as Category III with low to moderate habitat scores and a buffer width of 105 feet, with the exception of Wetlands 52c and G12, which are Category II wetlands. These PFO and PSS wetlands have varied amounts of functional vegetation cover.

Operations at a former golf course greatly altered the landscape and vegetation. Since the golf course was closed, invasive vegetation such as Himalayan blackberry and Scot's broom has become more prevalent. The area north of South 200th Street and east of the gravel access road is identified for habitat enhancement in the LSP due to the likely continued presence of the pump house.

The conceptual restoration plan includes substantial opportunity for wetland re-establishment, wetland preservation and enhancement, and buffer enhancement. To maximize wetland restoration area, a 100-foot buffer width was used for the conceptual plan. The total cost of this project is estimated between 28 and 29 million dollars for approximately 367 advanced mitigation credits, or 299 concurrent mitigation credits.

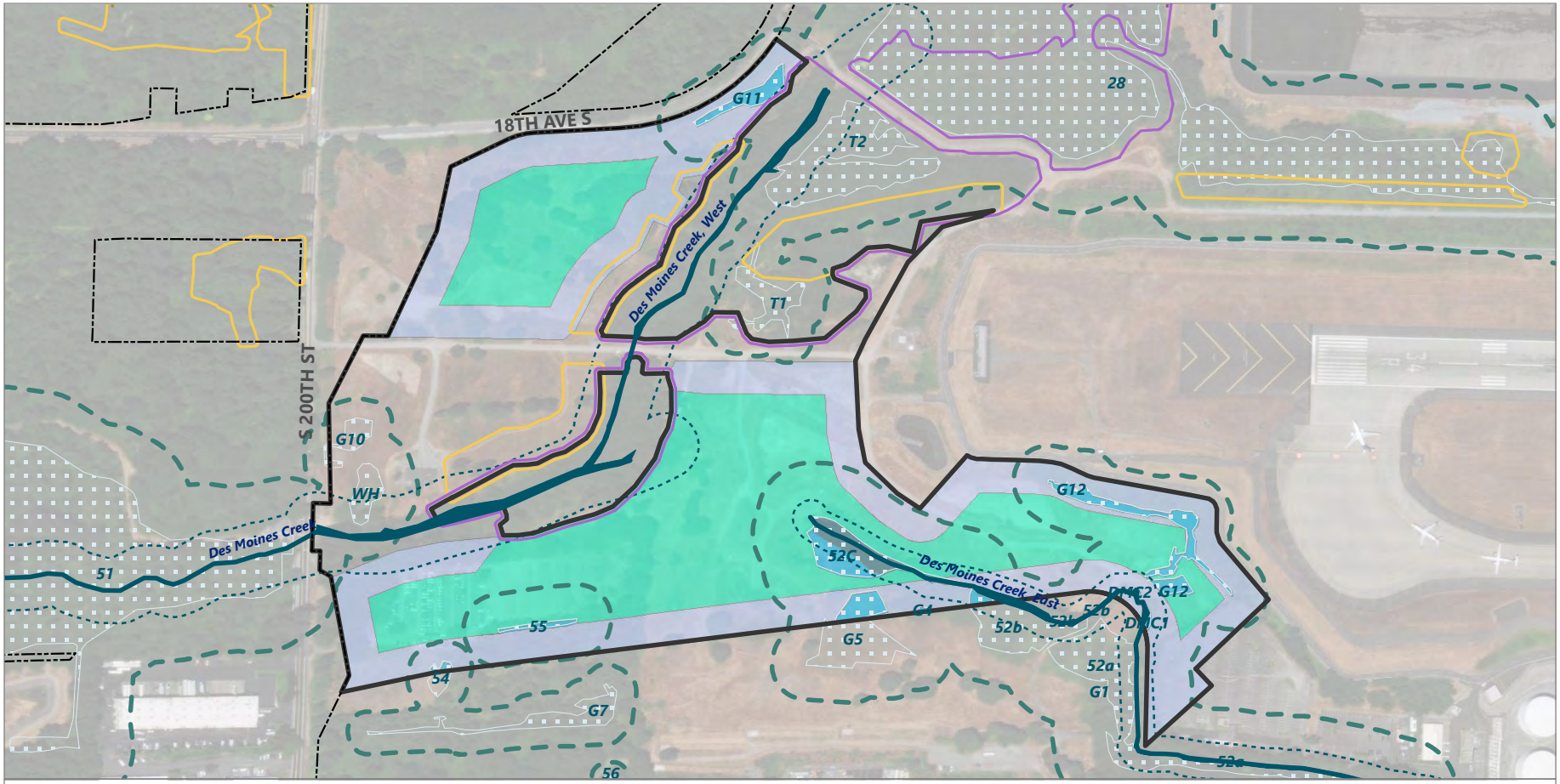

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Figure 8
MU 46: Tyee Golf Course Study Area
Mitigation Site Opportunity Assessment
Land Stewardship Plan: Appendix A

4.2 MU 48: Auburn Site Study Area

MU 48 (Figure 9), the Auburn Site Study Area, comprises 34 acres south of South 277th Street, just east of the intersection of 45th Street Northeast and I Street Northeast in the city of Auburn. Directly east of the MU is the existing 65-acre mitigation site that has a restrictive covenant and was constructed in 2006 to offset impacts due to the construction of the third runway at the Airport (MU 47). MU 48 is bordered on the north by a city right-of-way. The area is zoned as Open Space and has historically been used for agricultural purposes, but it is not in a designated Agricultural Production District.

Multiple wetland areas have been delineated at the site. Wetland A intersects with the restored Third Runway Mitigation Covenant wetland complex. It is dominated by reed canary grass (*Phalaris arundinacea*) and is ponded much of the year. An artificial stormwater ditch runs along the MU's southern boundary, along with a stormwater pond and small wetlands that are primarily composed of reed canary grass and mature cottonwood. A remnant ditch runs south to north and appears to connect to the southern wetlands. These features are undergoing a jurisdictional determination with the U.S. Army Corps of Engineers.

Site hydrology runs from the south to the north where it enters a ditch and continues off site in a pipe under South 277 Street, then to the Green River. Groundwater is likely approximately 2 to 6 feet below ground and is seasonally variable.

The Auburn Site Study Area has been evaluated in the context of surrounding land uses. This MU is encumbered by wetlands and buffers and has little to no opportunity for commercial or residential uses. Use of this site for mitigation would not impede any future development of adjacent properties. The Port has prepared a separate memorandum describing development potential for this property.

The conceptual plan proposes to enhance existing PFO, PSS, and PEM wetlands, and expand wetland area by re-establishing 14.8 acres of wetland (Figure 9). The mitigation design enhances and preserves 10.7 acres of buffer habitat, assuming a 100-foot buffer around the wetland that is not adjacent to the Port's previously constructed mitigation site. If this project were constructed as concurrent mitigation for a specific development need, it would generate approximately 307 mitigation credits at an estimated cost of between 18 and 19 million dollars. If constructed as advanced mitigation, the project would generate approximately 352 mitigation credits.

The site is large and would restore high-quality wetland habitat adjacent to the Port's existing 65-acre Third Runway Mitigation Covenant, making the habitat enhancements even more desirable. This 65-acre site to the east is immediately adjacent to the Green River. The site is being considered for fish habitat restoration activities involving breaching the existing berm between the site and the Green River.

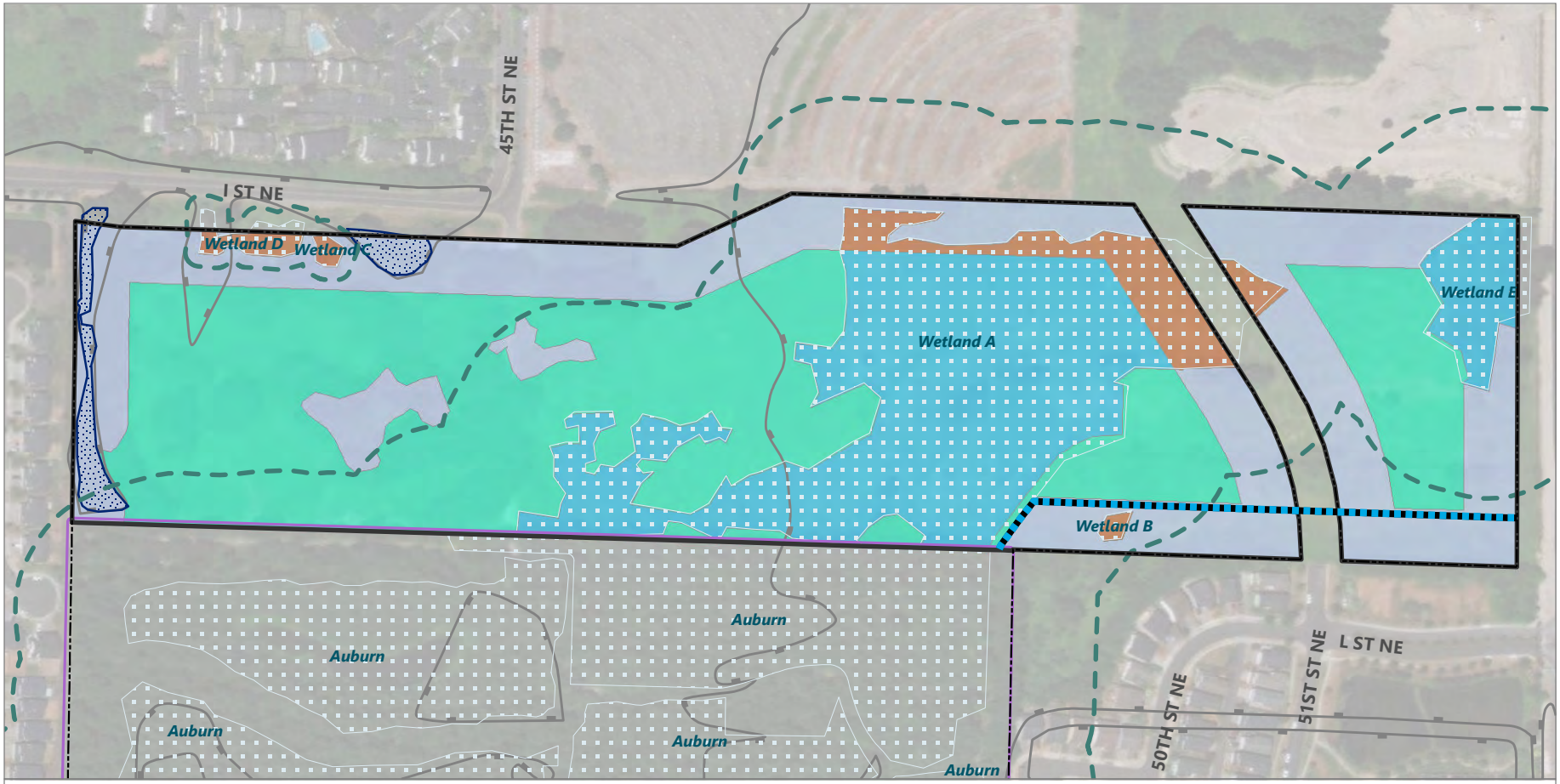

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Figure 9
MU 48: Auburn Site Study Area
Mitigation Site Opportunity Assessment
Land Stewardship Plan: Appendix A

5 Mitigation Bank Considerations

This section evaluates the key considerations for establishing an umbrella mitigation bank site in the Lower Green River and Nearshore subwatersheds. This includes mitigation bank site selection considerations, goals and objectives, the proposed service area, project need analysis, a general market assessment, and bank review and approval process.

5.1 Mitigation Bank Site Selection Considerations

The Port's umbrella mitigation bank will include several sites that are deemed appropriate to provide key functions within the watershed. Per joint regulatory agency guidance, the umbrella mitigation bank sites will be selected using a watershed approach, and each site will be designed using techniques suitable to its respective watershed position. The Port is planning to identify sites in the Duwamish Estuary, Nearshore, and Lower Green River subwatersheds of WRIA 9. The sites included in an umbrella mitigation bank should be large enough to support viable, self-sustaining habitat and designed to provide a suite of the highest-priority habitat elements.

As described earlier, development within WRIA 9 has degraded, fragmented, and converted floodplain and riparian habitat. This urbanization and loss of habitat is a primary limiting factor for Chinook salmon populations and loss of freshwater wetlands in the region. As part of the planned umbrella bank, sites would be located along both marine and estuarine areas within the Duwamish Estuary, and would ideally also include an additional freshwater site within the Lower Green River subwatershed. Together, these sites would restore wetland and riparian habitat functions and critical watershed processes that have been highly altered by urban development.

The aviation property sites listed in Section 4.1 were considered for possible inclusion in the umbrella bank prospectus as one or more freshwater site within WRIA 9. However, all of the sites in Section 4.1 would not be suitable for inclusion for one of several reasons. Though substantial mitigation credits could be generated within the Miller Creek East Study Area (MU 24; Section 4.1.2) and Tyee Golf Course Study Area (MU 46; Section 4.1.6), use of these MUs as mitigation bank sites would be limited by Federal Aviation Administration (FAA) rules due to their proximity to the Airport. Other aviation property sites discussed in Section 4.1 are too small or restricted by existing conditions and would not meet the following selection criteria. Only the Auburn Site Study Area would be a candidate for inclusion in an umbrella bank.

Sites to be selected for the bank should have the following factors, which were considered using the priorities and recommendations in watershed-based restoration plans for the Green/Duwamish

watershed; the Miller Creek, Walker Creek, and Des Moines subwatersheds; and the guidance provided in Washington Administrative Code (WAC) 173-700-303:

- **Size:** Watershed-based restoration plans value larger restoration projects over smaller ones, with the assumption that larger projects are more likely to support a diverse ecosystem and to be resilient and self-sustaining. Sites are identified as candidate mitigation bank sites with higher potential ecological value if they could accommodate more than 2 acres of combined created wetland habitat. The Auburn Site Study Area is an ideal candidate because it is a large site, providing nearly 15 acres of wetland re-establishment. The Tyee Golf Course Study Area and the Miller Creek East Study Area would both provide large wetland re-establishment areas, but are limited by FAA restrictions. Other airport MUs are not of adequate size.
- **Connectivity:** Watershed-based restoration plans recommend projects with high potential to connect to or complement existing wetlands or other habitat, create off-channel habitat, or establish a reconnection to a nearshore watershed drainage. The Auburn Site Study Area would be adjacent to and complement the Port's 65-acre wetland mitigation site immediately to the east. The Auburn Site Study Area would also provide approximately 10 acres of Green River flood storage, which is identified as a priority in the *Preliminary Background Report* (Our Green Duwamish Watershed Advisory Group 2016), serving to mitigate peak flows in the Green River and benefitting salmon. The Miller Creek East Study Area and Tyee Golf Course Study Area are each connected to creeks and connected to larger wetland areas, but are limited by FAA restrictions. Of the airport MUs considered, only the RST Property Study Area would have adequate connection to other wetland and habitat areas.
- **Distribution:** Watershed-based restoration plans value projects that contribute habitat in areas that lack it. The Auburn Site Study Area is ideal in that it is surrounded by residential and commercial development. This growth and development is becoming more and more common in the Lower Green River and Nearshore subwatersheds, resulting in high-quality wetland features becoming more and more scarce. Other sites are also located within developed areas, but are restricted for use as mitigation bank sites by the FAA due to their close proximity to the Airport.
- **Urgency:** Both WAC 173-700-303 and watershed-based restoration plans direct restoration efforts to projects that contribute to the improvement of identified management problems within the drainage basin or watershed. The Green-Duwamish River is considered the fourth most endangered river in the country, and providing floodplain habitat is critical for restoration of the system (American Rivers 2019). The Auburn Site Study Area has the opportunity to address flooding issues in the area by providing flood storage near the Green River. Of the airport MUs considered, the Miller Creek East, Tyee Golf Course, and RST Property study areas have opportunities to provide larger flood storage capacity, but each is restricted by the FAA.

The Auburn Site Study Area is the only site that is not restricted by the FAA for use as a bank site and meets the requirements for each of the previously identified factors. It should therefore be considered as a site within the Port's umbrella mitigation bank being proposed in coordination with the Maritime Division. Credits generated by the Auburn site would be calculated using procedures in WAC 173-700 (see Section 5.5.1) and may also be subject to the credit-debit method (Ecology 2012b).

5.2 Preliminary Goals and Objectives

Mitigation banks are the preferred alternative to permittee-responsible mitigation projects, because they are usually more likely to be successful than piecemeal mitigation afforded by traditional applicant-responsible sites. Banks also provide more ecological benefits at a watershed level, reduce permit processing times, and are more likely to be protected in perpetuity.

The goal of the umbrella mitigation bank is to provide a range of high-quality, long-term mitigation sites that can be used to offset unavoidable impacts to aquatic resources from new development in the Lower Green River, Duwamish Estuary, and Nearshore subwatersheds. To reach this goal, the umbrella mitigation bank must accomplish the following:

- Restore, create, or preserve wetland, riparian, and off channel habitat for fish and wildlife. Expanding rearing habitat for juvenile Chinook salmon will also provide more primary prey for Southern Resident killer whales.
- Assist in reaching the habitat restoration and species recovery goals for the Green-Duwamish and Central Puget Sound watersheds.
- Utilize economies of scale by combining required mitigation from individual smaller projects within the designated service area into collective mitigation at a larger site with greater ecological value.
- Use monitoring, long-term management, and commitments for repair, maintenance, and stewardship to ensure successful establishment and long-term viability.
- Employ a comprehensively designed system for restoration and enhancement actions that utilizes large sites to reduce the risk of mitigation failure.
- Provide institutional protections, including conservation easements, covenants, and long-term site management.
- Enable the Port and other businesses to meet regulatory mitigation requirements by providing a cost-effective, consistent, and predictable option for mitigation in the Lower Green River, Duwamish Estuary, and Nearshore subwatersheds, enabling economic development activity that may not otherwise be feasible without viable mitigation options.

5.3 Proposed Service Area

The proposed service area for the potential umbrella mitigation bank would serve the Lower Green River, Duwamish Estuary, and Nearshore subwatersheds within WRIA 9.

Proposed service area boundaries are based on alignment between the anticipated functions to be provided by the umbrella mitigation bank and the nature and likelihood of impacts requiring compensatory mitigation in the watershed surrounding the umbrella mitigation bank. Within the proposed service area, the Green River passes through industrial and commercial centers in Seattle, Tukwila, Renton, Auburn, and Kent. Future development in these areas, resulting in unavoidable impacts to aquatic habitat functions, would benefit from the use of the umbrella mitigation bank. At the same time, the proposed umbrella bank sites within the Lower Green River and Nearshore subwatersheds would have direct and indirect benefits to impacted habitats and their associated assemblages of fish and other species within the proposed service area.

5.4 Project Need Analysis

The Port umbrella mitigation bank will provide rare and valuable habitat for fish and wildlife in a highly urbanized, commercial, and industrial watershed. With federal, state, and local regulations developing stricter mitigation requirements and developable land becoming scarcer, demand for mitigation is high. Credits from the umbrella mitigation bank can be used for the Port's own future development projects, or development by other Port tenants, business owners, and government agencies to mitigate for freshwater wetland impacts and other freshwater and estuarine aquatic area impacts, as well as impacts to listed fish species and EFH. This section describes existing mitigation banks and in-lieu fee (ILF) programs and examines the Port's own mitigation needs that could be fulfilled by an umbrella mitigation bank in the Lower Green River, Duwamish Estuary, and Nearshore subwatersheds.

5.4.1 Existing Mitigation Banks and In-Lieu Fee Programs

Several mitigation credit purchase options have been developed in recent years. This section describes existing programs for purchasing credits for wetland and aquatic impacts.

5.4.1.1 King County In-Lieu Fee Mitigation Program

Only the King County ILF Mitigation Program has credits available for purchase for impacts in the Lower Green River and Nearshore watersheds. The Mitigation Reserves Program in King County operates the ILF program, which mitigates for impacts on wetlands, streams, or buffers in the same watershed as the impact. This ILF program differs from a mitigation bank in that fees are added for individual natural resource impacts that are pooled together to fund future mitigation projects. Mitigation banks develop pre-capitalized mitigation sites prior to release of credits. This program services all of King County, including the Central Puget Sound Service Area (which includes the Miller Creek, Walker Creek, and Des Moines Creek Nearshore subwatersheds and the Duwamish Estuary subwatershed) and Green River/Duwamish Service Area (which includes the Lower Green River and Upper Green River subwatersheds).

The Chinook Wind Mitigation Project, on the Duwamish River in Tukwila, is the mitigation site funded through the ILF program that services these areas. This project is in the design phase and will provide more than 4 acres of habitat, including intertidal, shallow water, and deep water refuge habitat. Mitigation fees vary based on costs of recent projects completed and the average cost of land at the time of mitigation fee purchase.

The cost per credit for the King County ILF Mitigation Program is $50,000 for freshwater wetland impacts, plus a land fee, which is $2.32 per square foot as of November 2018. Mitigation for estuarine or marine impacts is available on a case-by-case basis and would have a different cost per credit.

5.4.1.2 Springbrook Creek Wetland and Habitat Mitigation Bank

The Springbrook Creek Wetland and Habitat Mitigation Bank was created in 2006 for the sole purpose of providing mitigation credits for unavoidable impacts from Washington State Department of Transportation (WSDOT) projects and development by the City of Renton. The bank is on 127 acres in the Lower Green River watershed and provides approximately 45 mitigation credits though the re-establishment, rehabilitation, and enhancement of wetlands as well as the enhancement of upland and riparian areas. No credits from this mitigation bank are available to any parties besides WSDOT and the City of Renton.

5.4.1.3 Thom Mitigation Bank

The Thom Mitigation Bank is a proposed wetland mitigation bank that is in the review and approval process by the IRT. The Thom Mitigation Bank consists of 66-acres of land adjacent to the Green River in the city of Kent. The bank is in the Lower Green River watershed and will provide approximately 65 credits of wetland rehabilitation, creation, and enhancement, as well as the enhancement of upland native plant communities and riparian habitat. The service area for this bank includes the Lower and Middle Green River sub-basins in WRIA 9 but not the Duwamish Estuary subwatershed.

5.4.2 Port of Seattle Mitigation Needs

5.4.2.1 Maritime

Overall, the Port's Maritime Division has already created or enhanced more than 177 acres of wetlands and 30 acres of intertidal and saltwater habitat as mitigation, voluntary stewardship, or to offset injuries to natural resources from contamination. However, additional habitat restoration and conservation will be required to mitigate for impacts and to satisfy natural resource damage claims and other development activities.

In 2009, the Port adopted National Oceanic and Atmospheric Administration Fisheries' Lower Duwamish River Habitat Restoration Plan with the goal of enhancing fish and wildlife habitat to address injuries to natural resources that have been caused by the contamination of hazardous substance releases (the plan was finalized in June 2013; NOAA 2013). The Port is evaluating

opportunities to restore more than 70 acres on Port property in the Lower Green River watershed. The creation of a mitigation bank of large enough scale is one option to consolidate restoration activities that could both address natural resource damage obligations of the Port and other parties and provide additional credits for development needs.

The Maritime Division expects substantial demand for credits to satisfy natural resource damage claims along the Seattle waterfront and within the Lower Duwamish River in the next 5 years. The Port has also been approached by a handful of waterfront facility owners that are looking for mitigation options to offset expansion of waterfront structures. In addition, recent requirements for habitat mitigation associated with waterfront structure repair, maintenance, rehabilitation, and replacement has increased potential demand for mitigation credits associated with endangered salmon habitat impacts.

5.4.2.2 Aviation

At the Airport, the Port has a history of wetland mitigation for development activities. In 2009, the Port created several wetland mitigation sites to offset unavoidable impacts to wetlands and Miller Creek from the development of the third runway as part of the Airport's Master Plan Update Improvement Projects (MPU). On-site mitigation included construction of the Des Moines Nursery site, a 5.3-acre mitigation area on Miller Creek north of the Airport that was completed in November 2009. The other on-site project was the Miller Creek wetland and buffer restoration site that provided a total of 47.25 acres of mitigation for the MPU along Miller Creek, just west of the airport runways. Off-site mitigation for the MPU occurred approximately 9.5 miles south of the Airport in Auburn. The Auburn Wetland Development Project established a total of 65.38 acres of wetland re-establishment and wetland/buffer enhancement adjacent to the Green River. These projects were developed as project-specific mitigation, with no mitigation credits available for other Port or non-Port projects.

The Port will need to expand to match the rapid growth it will see in the next few years. According to the Sustainable Airport Master Plan, the Airport will require 35 new gates and 16 new wide-body gates to meet the demand of increased passengers and operations by 2034 (Port of Seattle 2018b). The airport expansion will come with expanded support services in the surrounding area, particularly in the South Aviation Support Area, which may result in unavoidable impacts to wetlands and other critical areas. Specific wetland mitigation needs have not been formally estimated, but will become more evident in the coming months and years.

5.4.3 Other Potential Mitigation Credit Purchasers

Informal outreach to commercial developers has suggested that developable land is becoming scarcer and demand for mitigation is high in the Green River area. Many properties remain encumbered by the presence of wetlands and wetland buffers, and most of these wetlands are low-quality Category III or IV wetlands dominated by reed canary grass with limited habitat function.

Cost-effective solutions for mitigation are not available for these wetlands and buffers, because concurrent mitigation requires land purchase and is expensive to design, permit, construct, and maintain individual wetland mitigation projects on a small scale. Costs for ILF credit purchases often make projects with wetland or buffer impacts economically infeasible due to the high price of credits, except for very small impacts.

Informal outreach was also conducted to planners from jurisdictions within the Lower Green River and Nearshore service area. These planners typically recommend mitigation to prospective developers either on site and in-kind or through the existing King County ILF program. Planners indicated they would support the creation of a mitigation bank with a service area that would cover their basin as another option for mitigation. They often respond to questions from multiple developers looking to discuss the same pieces of property within their jurisdiction that are undeveloped because of wetland and buffer encumbrances, which supports the notion that developable and unencumbered larger commercial properties are scarce in the area.

The City of Tukwila has no other marketable mitigation options besides the King County ILF program available and have had applicants discouraged from projects due to the high cost of the program (Cummins 2018). The City currently prioritizes on-site mitigation, but anticipates moving towards banking/ILF mitigation options with future code updates to be consistent with state and federal mitigation sequencing preferences (Cummins 2018).

The City of Auburn has had applicants use the King County ILF program for a few projects. The City prioritizes mitigation on city-owned properties but, for smaller projects, would benefit from a mitigation bank that is more cost-effective than the King County ILF program (Dixon 2018). The City has had inquiries about other potential mitigation options from public agencies, school districts, and private developers in the past (Dixon 2018).

The City of Des Moines prioritizes on-site or in-basin mitigation before deferring to off-site mitigation, but allows for use of the King County ILF program or mitigation banks within their service area (Lathrop 2018). They have seen larger development projects purchase credits from the King County ILF program for larger projects

Other public organizations may also require mitigation for transportation impacts in the Lower Green River watershed. This may include King County, local cities in the region, or WSDOT. The WA-509 extension or other WSDOT road projects have the potential for unavoidable impacts to wetlands, streams, or buffers. The preliminary alignment of the WA-509 extension may impact Des Moines Creek and its buffer and potentially other areas, including an existing WSDOT mitigation site.

5.5 Process of Review and Approval

Under both state and federal mitigation regulations, a mitigation bank for wetlands and/or other aquatic resources must be reviewed, evaluated, and negotiated with members of several agencies (the IRT). If the mitigation bank is intended to comply with both state and federal mitigation requirements, the IRT is typically chaired by Ecology and co-chaired by the U.S. Army Corps of Engineers.

To begin the process of mitigation bank review and approval, the project sponsor must create a prospectus that provides a conceptual plan for the mitigation bank. Creation of the prospectus initiates the coordination between the project sponsor and the IRT. Requirements for content of the prospectus are outlined in WAC 173-700-211. After submittal and public review of the prospectus, the IRT convenes to determine if the mitigation bank may proceed with creation of the mitigation bank instrument, which is the regulatory agreement that sets the terms and conditions of bank approval. The instrument includes determination of the number and type of credits that can be purchased, legal obligations, operational requirements, monitoring, and long-term maintenance. The sponsor and IRT may work in coordination on the instrument to identify potential issues before submittal. Once submitted, the instrument is reviewed and approved by the IRT and signatories from state and federal departments, local jurisdictions, and the sponsor.

An instrument can describe the following four types of credits:

- **Potential:** Anticipated to be generated by the bank at a future date but have not been released
- **Available:** Released and available for purchase to compensate for unavoidable wetland impacts
- **Reserved:** Purchased but not associated with a specific regulatory requirement (i.e., purchased to offset anticipated impacts from a future project)
- **Debited**: Purchased to meet regulatory requirements

Under an umbrella bank scenario, negotiations with the IRT may result in the use of universal mitigation credits that are released for impacts for a variety of habitat types and are not tied to a specific habitat credit at a specific bank site.

5.5.1 Calculation of Mitigation Credits

The number of credits available for purchase from the mitigation bank is calculated by using a credit conversion ratio and the acres of the implemented activity, or the credit-debit method described in Section 4.1. The credit conversion ratio is determined separately for each mitigation bank based on a range of factors. These factors include physical characteristics, anticipated gains in wetland function, anticipated success of restoration actions, the degree to which the bank incorporates the watershed approach, protection or enhancement of listed species, and the opportunity for public access and education (WAC 173-700-314). Washington State provides guidance for wetland credit conversion ratios

using the credit-debit method (Ecology 2012b); however, the Wetlands Mitigation Banking Act (90.84 Revised Code of Washington) requires standard credit conversion rates for wetland re-establishment, creation, rehabilitation, and enhancement, as established in WAC 173-700-314. Table 2 summarizes the ratios, which may vary between sites, but are expected to remain within the range described in WAC 173-700-313. Currently, there are no standard credit ratios required in state regulations for other aquatic resource restoration such as floodplains, riparian vegetation, or stream functions.

Table 2
Wetland Credit Conversion Ratios

Mitigation Activity	Range (Area of Activity: Credit)
Wetland re-establishment	1:1 to 2:1
Wetland creation (establishment)	1:1 to 2:1
Wetland rehabilitation of altered processes	2:1 to 3:1
Enhancement of wetland structure	3:1 to 5:1
Wetland preservation: In combination with re-establishment, creation, rehabilitation, or enhancement*	5:1 to 10:1
Wetland preservation: Alone	Case-by-case
Upland habitat enhancement	3:1 to 10:1
Preservation of high-quality upland habitat*	8:1 to 15:1

Note:
*More credit for the preservation of wetlands or high-quality upland habitat is likely in future guidance updates.

5.5.2 Calculation of Mitigation Debits

The credit-debit method (Ecology 2012b) is the most common method of determining the mitigation credit purchasing requirements for unavoidable impacts to aquatic resources, known as debits. This method is similar to the method of determining the number of mitigation bank credits, but focuses on the functions of the affected wetland and/or aquatic resource. Debit ratios used for mitigation banks are typically lower than those used for individual mitigation sites, due to the lower risk of mitigation failure and known ecological functions of the mitigation site. The ratio used to determine the number of credits required to satisfy regulatory mitigation requirements is determined on a site-by-site basis. For wetland impacts, it is most common to use the credit-debit method to determine the wetland functions that need to be replaced in the mitigation bank; however, some banks may calculate impacts based on wetland acreage, depending on the accounting procedure established in the wetland mitigation banking instrument. Currently, there are no standard state methods or guidelines to calculate debits for other aquatic resources such as floodplains, riparian vegetation, or stream functions.

5.6 General Market Assessment for a Potential Umbrella Bank

5.6.1 Project Cost Factors

Key mitigation bank cost factors include size, scale, type of construction, and the extent that efficiencies can be realized during construction and long-term maintenance and monitoring. Larger mitigation sites generate more credits, and larger construction projects usually are associated with lower costs per acre of construction or per credit generated. Smaller sites usually do not have the economy of scale to be cost-effective. Mitigation sites with more excavation and earth work also add cost, especially compared to projects that may only require minor earth work, such as dike breaching, filling ditches, and revegetation.

Maintenance and monitoring are also important considerations. In general, banks that involve complex hydraulic engineering features and/or questionable water sources (e.g., pumped) are most costly to develop, operate and maintain, and have a higher risk of failure than banks designed to function with little or no human intervention. Avoiding situations where wetlands must be actively managed to ensure their viability and sustainability will reduce project costs.

Other costs for bank development includes the cost of financing the construction effort, providing financial guarantees required as part of the mitigation bank instrument, and overseeing and administering a mitigation bank site. Efficient oversight and management of the bank with staff dedicated to this function will save money in the long term.

5.6.2 Price of Mitigation Credits

Establishing the price of mitigation credits for release to the bank sponsor or for sale to a third party is determined by the bank sponsor. Credit price is market driven, considering the cost for permittee-responsible mitigation in the area and what applicants are willing to pay for a credit. Competition in the area is also a factor, including whether there are other banks or ILF programs that share a similar service area (see Section 5.4.1), which can drive the price of credits down. The price should also be set at a level to recoup the investment cost in establishing the bank and managing and maintaining the site. Public organizations are often further held to a full cost accounting standard, which requires all costs invested in developing and operating the bank be considered in setting the price, such as land acquisition; project planning and design; construction; plant materials; labor; legal fees; monitoring; remediation, adaptive management, or contingency activities, including uncertainties in construction and real estate expenses; administration of the program; resources necessary for the long-term management and protection of the project; and financial assurances necessary to ensure successful project. Full cost accounting standards are required by law for ILF programs sponsored by public agencies in the wetland mitigation rule (40 Code of Federal Regulations 230). While full cost accounting of public organizations operating mitigation banks are

not specifically identified in the wetland mitigation rule, most public organizations in Washington tend to follow this procedure.

Under the umbrella mitigation bank scenario being planned in coordination with the Maritime Division, the price per credit may be set based on full costs of all mitigation sites in the umbrella bank. Umbrella mitigation banks usually have multiple sites within the bank, which could be used to calculate the umbrella bank credit price rather than calculating the price for a credit associated with a single site in the bank. This means that while the price per credit for one site may be substantially more expensive to construct, but one or two other sites are less expensive, the credit price for an umbrella bank credit could be calculated based on the average price of full costs for all sites. This appendix does not consider the cost of construction or the potential credit price for all sites that are being considered in the umbrella bank, but will be completed in subsequent steps following development of the umbrella bank prospectus.

5.6.3 Auburn Site Study Area Opinion of Probable Costs

Attachment A contains a detailed opinion of probable cost for the Auburn Site Study Area conceptual mitigation plan. The estimate is based on a 10% conceptual design. Unit cost data were generated using regional resources such as WSDOT bid tabs and RS Means. The estimate reflects the elements identified in the bid tabs from the 2006 mitigation project on the adjacent Port-owned Auburn property, but due to the time passed and construction escalation, the Attachment A costs do not use the same unit costs.

The opinion of probable costs includes 10 years of monitoring and maintenance and includes Port-specific management costs, consistent with percentages provided for the Port's recent Terminal 117 project. An assessed land value cost was not available on King County's GIS system and is not included with the opinion of probable cost; however, the assessed value may need to be considered in setting the credit price if this site is included as a bank site.

Key uncertainties that affect the opinion of probable costs include depth of excavation required to support wetland hydrology, presence of subsurface geology and potential confining layers, and changes in the conceptual design, such as the area of scrub-shrub, forested, emergent, and potential open water habitat.

5.6.4 Mitigation Bank Credit Price Considerations

This section estimates the number of credits potentially generated from the conceptual plan described in Section 4.2 for the Auburn Site Study Area. The ultimate method for deriving the number of credits and the "currency" used for accounting will be determined in the mitigation bank instrument. Two methods for calculating credits are presented in this section.

5.6.4.1 Mitigation Credits Generated from Auburn Site Study Area

Table 3 presents the range of mitigation bank credits using the wetland credit conversion ratios described in state code (WAC 173-700-313). This method establishes credits on an acreage basis, and may be better described as acre-credits. Between 9.7 and 19.09 credits would be generated at the Auburn Site Study Area using this method. Credit purchasers seeking to offset their wetland impacts through the use of bank credits could calculate their "debits" using the same acre-based currency described in Table 3. However, most banks and local regulations prefer to use the credit-debit method (Ecology 2012b) to calculate credits required to offset wetland impacts.

Table 3
Potential Range of Proposed Auburn Mitigation Site Bank Credits Using the Wetland Credit Conversion Ratios (WAC 173-700-313)

Mitigation	Acres	Ratio (Area of Activity: Number of Credits)					
Total Mitigation Activity	28.76	Allowed ratio in WAC	1:1	2:1	2:1	3:1	10:1
PFO/PSS establishment	7.4	1:1 to 1:2	7.4	3.7			
PEM establishment	7.4	1:1 to 1:2	7.4	3.7			
PFO/PSS enhancement	4.0	2:1 to 3:1			2.0	1.33	
PEM enhancement	4.0	2:1 to 3:1			2.0	1.33	
Buffer enhancement	10.7	3:1 to 10:1				3.57	1.07
		Total Credits (high)	**22.37**				
		Total Credits (low)	**11.13**				

Using the credit-debit method, credits generated by the Auburn mitigation site would be calculated based are estimated functional improvement from existing conditions. This method uses acre-points, which is a measure of function and size. The estimated credits generated by enhancing existing wetlands is calculated by comparing current function of the wetland to the anticipated long-term function following construction and development of a mature vegetation community. This functional lift would be applied to each existing wetland separately. Similarly, wetlands generated from existing upland area have zero wetland function under the debit-credit method and get full credit for the wetland functions provided by the new wetland establishment (creation). Credits are generated for different Cowardin classifications of wetlands (PSS, PEM, PFO), with some limited credits for enhancement of upland buffers.

Table 4 presents the assumptions used for Wetland A to estimate the functional improvement following wetland enhancement. The same post-construction functions were applied to the newly established wetland expansion area. These ratings are preliminary and will be revisited following further evaluation and design of the conceptual mitigation design. Using these assumptions, the Auburn Site Study Area would generate approximately 352 credits using the acre-point currency.

Table 4
Estimated Credits by Function for the Proposed Auburn Mitigation Site

Rating Type	Improving Water Quality	Hydrologic	Habitat
Wetland A Rating Before Mitigation			
Site Potential	Moderate	Moderate	Low
Landscape Potential	Low	Moderate	Moderate
Value	High	Moderate	Low
Wetland A Rating After Mitigation for Enhancement and Establishment			
Site Potential	Moderate	Moderate	High
Landscape Potential	Moderate	High	High
Value	High	High	Low
Total Credits by Function for Project	**107.6**	**126.4**	**118.28**
Total Project Credits	**352.3**		

Source: Ecology 2012b

5.6.4.2 Price Comparison

The credits estimated using the credit-debit method are comparable to the currency used by the King County ILF program. As of November 2018, the price per credit from the King County ILF was $50,000 for freshwater wetland impacts, plus a land fee, which is $2.32 per square foot. The cost for 352.3 credits purchased from the King County ILF program would be $17,615,000, plus the cost for the impact area (20 acres would be around $2,000,000). Together, the price to purchase an equivalent number of credits from the ILF program is $19,615,000. (The cost of land is not considered in this total.)

As presented in Attachment A, the conceptual-level cost for construction at the Auburn Site is approximately $18,323,000 This suggests that the Port could set the price for a mitigation credit slightly lower than the cost for a mitigation credit purchased from the King County ILF program, or could set the price at the same level as the King County ILF, which would generate revenue for the Port from the project. The Port may also consider setting mitigation credit prices based on total construction costs of all umbrella mitigation bank sites, including the estuarine and marine sites in the Duwamish River. As a public agency, the Port may use full cost accounting and choose to limit the amount of profit generated by credit sales (Section 5.6.2). Over time, construction costs are anticipated to rise, which will affect both the Auburn Site Study Area construction cost and the price per credit for the King County ILF program.

5.6.4.3 Other Considerations

The Port may consider reserving all or some credits from the bank for their own use; however, this decision depends on forecasts for Port development and unavoidable wetland impacts. If development forecasts are uncertain, the Port may consider making all credits available to the public,

in which case credits for Port projects would be purchased as and when needed until exhausted. The amount of time for all credits to be sold at the bank depends on the market and the timeframes established in the instrument, which can stipulate that credits are not released for 10 years.

Using the Auburn Site Study Area as a mitigation bank would generate revenue for a property with very low revenue generation potential. The site would also reduce mitigation requirements because of the reduced temporal loss associated with advanced mitigation. Construction cost inflation would increase the cost for mitigation over time, particularly if it was constructed as concurrent mitigation alongside a Port development project. However, concurrent mitigation can result in delays of development projects. The Auburn Site Study Area could accommodate or reduce the potential for delays or missed opportunities for Port development activities by reducing the timeframe and cost associated with wetland mitigation. If developed as a mitigation bank, and depending on the Port's forecasted mitigation needs, credits could be: 1) kept wholly by the Port for future impacts; 2) all made available for sale to other parties, which may limit the Port's use if demand is extremely high; or 3) partly reserving credits for Port use while allowing the remaining to be available for sale to other parties.

6 Summary

This appendix describes the potential for a number of MUs to provide mitigation for unavoidable wetland and/or buffer impacts through wetland and buffer restoration, establishment (creation), enhancement, and/or preservation. Conceptual designs and costs associated with these scenarios are presented in Section 4. Several of these sites near the airport should be considered for concurrent or advanced mitigation, depending on future Port mitigation needs.

One of the MUs, the Auburn Site Study Area, has the potential to be included as a site in an umbrella mitigation bank, which is being proposed in coordination with the Maritime Division. Other aviation MUs are either restricted for use as a bank site by FAA regulations or do not meet one or more criteria required in establishing bank sites. The Auburn Site Study Area is nearly 29 acres, and preliminary estimates of construction and long-term costs and the number of credits generated suggest this site could be cost-competitive with the King County ILF program. The Auburn Site Study Area should be further considered for inclusion in the umbrella bank prospectus, which is planned for submission to the IRT in May 2019.

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Attachment A
Opinion of Probable Costs

MU 6 - Borrow Site Mitigation Construction Opinion of Probable Costs

Item	Quantity	Unit	Unit Cost	Subtotal
Site Preparation				
TESC measures	1	LS	$ 24,650.00	$ 24,650
Clear and grub invasive vegetation from buffer	325,215	SF	$ 0.20	$ 65,043
Planting and Irrigation				
Amend existing soils in plantings areas (4" depth)	5,348	CY	$ 42.00	$ 224,615
Procure and install coniferous tree (1 gallon, 10' O.C.)	2,003	EA	$ 19.85	$ 39,750
Procure and install deciduous trees (1 gallon, 10')	1,503	EA	$ 19.85	$ 29,827
Procure and install shrub (1 gallon, 6' O.C.)	4,173	EA	$ 19.85	$ 82,813
Haul and place mulch (4" depth)	5,348	CY	$ 42.00	$ 224,615
Install temporary irrigation (created/enhanced wetland and buffer)	433,620	SF	$ 1.50	$ 650,430
			Subtotal Construction	**$ 1,341,743**
			Mobilization (10%)	$ 134,174
			Subtotal Construction Direct Costs	**$ 1,475,917**
			Design Development Allowance (5%)	$ 73,796
			Escalation (Calc to mid-point of const 12/31/21, 5% per year)	
			GC's. Home Office, Bond and Profit (0%)	$ -
			Estimated Construction Bid Amount	$ 1,549,713
			Major Construction Contingency (10%)	$ 154,971
			Subtotal Construction Costs with ODCs & Contingency (for Soft Cost basis)	$ 1,704,684
			WA State Sales Tax: Major Construction (10.1%)	$ 172,173
			WA State Sales Tax: PCS (9.5%)	$ -
			Subtotal Construction + Mobilization + Contingencies + Tax	**$ 1,876,857**

Design - POS Design Mgmt $& Suipport (4.49%)				$	84,270.88
	Design - A/E Support (3.36%)			$	63,062.39
	PM (Design & Constr, 3.93%)			$	73,760.48
	PM Commissioning (0%)			$	-
			CM (4.57%)	$	85,772.36
		Eng Admin (1.12%)		$	21,020.80
		Health & Safety (0.28%)		$	5,255.20
			Safety (0.11%)	$	2,064.54
	Designer Const Support (0.60%)			$	11,261.14
	Envr Constr Support (2.44%)			$	45,795.31
Construction Testing/Monitoring (CQA, 0.33%)				$	6,193.63
		Contract Admin (0.68%)		$	1,276.26
			Admin (5.61%)	$	105,291.67
Env & Permitting - Support and Reviews (5.61%)				$	105,291.67
	Env & Permitting - Legal (1.12%)			$	21,020.80
Env & Permitting - Agency Oversight/Permit (0.33%)				$	6,193.63
Subtotal PMG and Other Soft Costs				**$**	**2,514,387.70**
		Art Program (0.66%)		$	165.95
	Annual Maintenance (10 years)			$	134,570.58
Corrective Measure Contingency (10% construction subtotal)				$	134,174.25
	Annual Monitoring (10 years)			$	2,431,352.61
TOTAL PROJECT ESTIMATED PROGRAM COST				**$**	**5,214,651.09**

Costs are in 2018 dollars. Escalation for 2019/2020 construction is recommended at 5% per year.

In providing opinions of probable construction cost, the Client understands that the Consultant (Anchor QEA L.L.C.) has no control over the cost or availability of labor, equipment or materials, or over market condition or the Contractor's method of pricing, and the consultant's opinions of probable construction costs are made on the basis of the Consultant's professional judgment and experience. The Consultant makes no warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from the Consultant's opinion of probable construction cost.

MU 24 - Miller Creek Wetland Mitigation Construction Opinion of Probable Costs

Item	Quantity	Unit	Unit Cost	Subtotal
Site Preparation				
TESC measures	1	LS	$ 89,960.00	$ 89,960
Clear and grub invasive vegetation from buffer	142,180	SF	$ 0.20	$ 28,436
Earthwork				
Cut and stockpile existing topsoil (1-ft depth, outside of existing developed area and areas with RCG)	8,777	CY	$ 10.50	$ 92,154
Cut and fill for wetland creation (average 4.5-ft depth, remove volume of salvaged topsoil in wetland creation area; includes over-excavation). Place fill in buffer area	20,731	CY	$ 10.50	$ 217,679
Procure, place and compact wetland topsoil (12" depth, wetland creation area only)	8,293	CY	$ 42.00	$ 348,306
Place and compact on-site stockpiled topsoil in buffer (12" depth, buffer only)	8,777	CY	$ 11.50	$ 100,930
Planting and Irrigation				
Procure and install coniferous tree (1 gallon, 10' O.C.)	1,278	EA	$ 19.85	$ 25,362
Procure and install deciduous trees (1 gallon, 10')	1,059	EA	$ 19.85	$ 21,016
Procure and install shrub (1 gallon, 6' O.C.)	5,542	EA	$ 19.85	$ 109,981
Procure and install livestake (3' O.C.)	11,896	EA	$ 3.00	$ 35,688
Procure and install emergent (2' O.C.)	0	EA	$ 6.00	$ -
Haul and place mulch (4" depth)	5,787	CY	$ 42.00	$ 243,052
Install temporary irrigation (created/enhanced wetland and buffer)	468,743	SF	$ 2.20	$ 1,031,234
		Subtotal Construction		**$ 2,602,544**
		Mobilization (10%)		$ 260,254
	Subtotal Construction Direct Costs			**$ 2,862,798**
	Design Development Allowance (5%)			$ 143,140
Escalation (Calc to mid-point of const 12/31/21, 5% per year)				
		GC's. Home Office, Bond and Profit (0%)		$ -
	Estimated Construction Bid Amount			$ 3,005,938
	Major Construction Contingency (10%)			$ 300,594
Subtotal Construction Costs with ODCs & Contingency (for Soft Cost basis)				$ 3,306,532

WA State Sales Tax: Major Construction (10.1%)				$	333,960
	WA State Sales Tax: PCS (9.5%)			$	-
Subtotal Construction + Mobilization + Contingencies + Tax				**$**	**3,640,492**
Design - POS Design Mgmt $& Suipport (4.49%)				$	163,458.08
	Design - A/E Support (3.36%)			$	122,320.52
	PM (Design & Constr, 3.93%)			$	143,071.32
		PM Commissioning (0%)		$	-
			CM (4.57%)	$	166,370.47
		Eng Admin (1.12%)		$	40,773.51
		Health & Safety (0.28%)		$	10,193.38
			Safety (0.11%)	$	4,004.54
	Designer Const Support (0.60%)			$	21,842.95
	Envr Constr Support (2.44%)			$	88,828.00
Construction Testing/Monitoring (CQA, 0.33%)				$	12,013.62
		Contract Admin (0.68%)		$	2,475.53
			Admin (5.61%)	$	204,231.58
Env & Permitting - Support and Reviews (5.61%)				$	204,231.58
	Env & Permitting - Legal (1.12%)			$	40,773.51
Env & Permitting - Agency Oversight/Permit (0.33%)				$	12,013.62
	Subtotal PMG and Other Soft Costs			**$**	**4,877,093.89**
		Art Program (0.66%)		$	321.89
	Annual Maintenance (10 years)			$	48,750.00
Corrective Measure Contingency (10% construction subtotal)				$	260,254.38
	Annual Monitoring (10 years)			$	1,051,316.43
TOTAL PROJECT ESTIMATED PROGRAM COST				**$**	**6,237,736.59**

Costs are in 2018 dollars. Escalation for 2019/2020 construction is recommended at 5% per year.

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MU 26 - Wetland 2 Mitigation Construction Opinion of Probable Costs

Item	Quantity	Unit	Unit Cost	Subtotal
Site Preparation				
TESC measures	1	LS	$ 17,000.00	$ 17,000
Clear and grub invasive vegetation from wetland	10,165	SF	$ 0.20	$ 2,033
Clear and grub invasive vegetation from buffer	73,702	SF	$ 0.20	$ 14,740
Planting and Irrigation				
Amend existing soils in plantings areas (4" depth)	884	CY	$ 42.00	$ 37,114
Procure and install coniferous tree (1 gallon, 10' O.C.)	302	EA	$ 19.85	$ 5,993
Procure and install deciduous trees (1 gallon, 10')	231	EA	$ 19.85	$ 4,584
Procure and install shrub (1 gallon, 6' O.C.)	755	EA	$ 19.85	$ 14,983
Procure and install livestake (3' O.C.)	522	EA	$ 3.00	$ 1,566
Haul and place mulch (4" depth)	884	CY	$ 42.00	$ 37,114
Install temporary irrigation (created/enhanced wetland and buffer)	133,002	SF	$ 2.20	$ 292,604
			Subtotal Construction	**$ 427,732**
			Mobilization (10%)	$ 42,773
			Subtotal Construction Direct Costs	**$ 470,505**
			Design Development Allowance (5%)	$ 23,525
			Escalation (Calc to mid-point of const 12/31/21, 5% per year)	
			GC's. Home Office, Bond and Profit (0%)	$ -
			Estimated Construction Bid Amount	$ 494,030
			Major Construction Contingency (10%)	$ 49,403
			Subtotal Construction Costs with ODCs & Contingency (for Soft Cost basis)	$ 543,433

			WA State Sales Tax: Major Construction (10.1%)	$	54,887
			WA State Sales Tax: PCS (9.5%)	$	-
			Subtotal Construction + Mobilization + Contingencies + Tax	**$**	**598,320**
			Design - POS Design Mgmt $& Suipport (4.49%)	$	26,864.55
			Design - A/E Support (3.36%)	$	20,103.54
			PM (Design & Constr, 3.93%)	$	23,513.96
			PM Commissioning (0%)	$	-
			CM (4.57%)	$	27,343.21
			Eng Admin (1.12%)	$	6,701.18
			Health & Safety (0.28%)	$	1,675.29
			Safety (0.11%)	$	658.15
			Designer Const Support (0.60%)	$	3,589.92
			Envr Constr Support (2.44%)	$	14,599.00
			Construction Testing/Monitoring (CQA, 0.33%)	$	1,974.45
			Contract Admin (0.68%)	$	406.86
			Admin (5.61%)	$	33,565.73
			Env & Permitting - Support and Reviews (5.61%)	$	33,565.73
			Env & Permitting - Legal (1.12%)	$	6,701.18
			Env & Permitting - Agency Oversight/Permit (0.33%)	$	1,974.45
			Subtotal PMG and Other Soft Costs	**$**	**801,556.82**
			Art Program (0.66%)	$	52.90
			Annual Maintenance (10 years)	$	15,271.42
			Corrective Measure Contingency (10% construction subtotal)	$	42,773.15
			Annual Monitoring (10 years)	$	298,302.58
			TOTAL PROJECT ESTIMATED PROGRAM COST	**$**	**1,157,956.88**

Costs are in 2018 dollars. Escalation for 2019/2020 construction is recommended at 5% per year.

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MU 42 - RST Property Mitigation Construction Opinion of Probable Costs				
Item	Quantity	Unit	Unit Cost	Subtotal
Site Preparation				
TESC measures	1	LS	$ 19,140.00	$ 19,140
Demolish existing crushed gravel surfacing	37,500	SF	$ 0.60	$ 22,500
Clear and grub invasive vegetation from buffer	71,790	SF	$ 0.20	$ 14,358
Earthwork				
Cut and stockpile existing topsoil (1-ft depth, outside of existing developed area and areas with RCG)	2,659	CY	$ 10.50	$ 27,918
Cut and fill for wetland creation (average 2.5-ft depth, remove volume of salvaged topsoil in wetland creation area; includes over-excavation). Place fill in buffer area	4,480	CY	$ 10.50	$ 47,039
Procure, place and compact wetland topsoil (12" depth, wetland creation area only)	1,792	CY	$ 42.00	$ 75,264
Place and compact on-site stockpiled topsoil in buffer (12" depth, buffer only)	2,659	CY	$ 11.50	$ 30,577
Planting and Irrigation				
Procure and install coniferous tree (1 gallon, 10' O.C.)	436	EA	$ 19.85	$ 8,652
Procure and install deciduous trees (1 gallon, 10')	359	EA	$ 19.85	$ 7,124
Procure and install shrub (1 gallon, 6' O.C.)	1,654	EA	$ 19.85	$ 32,824
Procure and install livestake (3' O.C.)	3,104	EA	$ 3.00	$ 9,312
Procure and install emergent (2' O.C.)	9,669	EA	$ 6.00	$ 58,014
Haul and place mulch (4" depth)	2,035	CY	$ 42.00	$ 85,466
Install temporary irrigation (created/enhanced wetland and buffer)	164,827	SF	$ 2.20	$ 362,619
	Subtotal Construction			**$ 800,808**
			Mobilization (10%)	$ 80,081
	Subtotal Construction Direct Costs			**$ 880,889**
	Design Development Allowance (5%)			$ 44,044
Escalation (Calc to mid-point of const 12/31/21, 5% per year)				
	GC's. Home Office, Bond and Profit (0%)			$ -
	Estimated Construction Bid Amount			$ 924,934
	Major Construction Contingency (10%)			$ 92,493
Subtotal Construction Costs with ODCs & Contingency (for Soft Cost basis)				$ 1,017,427

WA State Sales Tax: Major Construction (10.1%)				$	102,760
	WA State Sales Tax: PCS (9.5%)			$	-
Subtotal Construction + Mobilization + Contingencies + Tax				**$**	**1,120,187**
Design - POS Design Mgmt $& Suipport (4.49%)				$	50,296.40
	Design - A/E Support (3.36%)			$	37,638.28
	PM (Design & Constr, 3.93%)			$	44,023.35
	PM Commissioning (0%)			$	-
			CM (4.57%)	$	51,192.55
		Eng Admin (1.12%)		$	12,546.09
	Health & Safety (0.28%)			$	3,136.52
			Safety (0.11%)	$	1,232.21
	Designer Const Support (0.60%)			$	6,721.12
	Envr Constr Support (2.44%)			$	27,332.56
Construction Testing/Monitoring (CQA, 0.33%)				$	3,696.62
	Contract Admin (0.68%)			$	761.73
			Admin (5.61%)	$	62,842.49
Env & Permitting - Support and Reviews (5.61%)				$	62,842.49
	Env & Permitting - Legal (1.12%)			$	12,546.09
Env & Permitting - Agency Oversight/Permit (0.33%)				$	3,696.62
	Subtotal PMG and Other Soft Costs			**$**	**1,500,692.10**
		Art Program (0.66%)		$	99.05
	Annual Maintenance (10 years)			$	16,396.93
Corrective Measure Contingency (10% construction subtotal)				$	80,080.82
	Annual Monitoring (10 years)			$	369,681.06
TOTAL PROJECT ESTIMATED PROGRAM COST				**$**	**1,966,949.95**

Costs are in 2018 dollars. Escalation for 2019/2020 construction is recommended at 5% per year.

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MU 45 - West Side Mitigation Construction Opinion of Probable Costs				
Item	Quantity	Unit	Unit Cost	Subtotal
Site Preparation				
TESC measures	1	LS	$ 32,850.00	$ 32,850
Clear and grub invasive vegetation from buffer	380,689	SF	$ 0.20	$ 76,138
Planting and Irrigation				
Amend existing soils in plantings areas (4" depth)	4,700	CY	$ 42.00	$ 197,394
Procure and install coniferous tree (1 gallon, 10' O.C.)	1,486	EA	$ 19.85	$ 29,490
Procure and install deciduous trees (1 gallon, 10')	1,115	EA	$ 19.85	$ 22,127
Procure and install shrub (1 gallon, 6' O.C.)	3,095	EA	$ 19.85	$ 61,420
Haul and place mulch (4" depth)	4,700	CY	$ 42.00	$ 197,394
Install temporary irrigation (created/enhanced wetland and buffer)	321,616	SF	$ 1.50	$ 482,424
		Subtotal Construction		**$ 1,099,238**
			Mobilization (10%)	$ 109,924
	Subtotal Construction Direct Costs			**$ 1,209,161**
	Design Development Allowance (5%)			$ 60,458
Escalation (Calc to mid-point of const 12/31/21, 5% per year)				
GC's. Home Office, Bond and Profit (0%)				$ -
	Estimated Construction Bid Amount			$ 1,269,619
Major Construction Contingency (10%)				$ 126,962
Subtotal Construction Costs with ODCs & Contingency (for Soft Cost basis)				$ 1,396,581

WA State Sales Tax: Major Construction (10.1%)				$	141,055
	WA State Sales Tax: PCS (9.5%)			$	-
Subtotal Construction + Mobilization + Contingencies + Tax				**$**	**1,537,636**
Design - POS Design Mgmt $& Suipport (4.49%)				$	69,039.86
	Design - A/E Support (3.36%)			$	51,664.57
	PM (Design & Constr, 3.93%)			$	60,429.10
		PM Commissioning (0%)		$	-
			CM (4.57%)	$	70,269.97
		Eng Admin (1.12%)		$	17,221.52
		Health & Safety (0.28%)		$	4,305.38
			Safety (0.11%)	$	1,691.40
	Designer Const Support (0.60%)			$	9,225.82
	Envr Constr Support (2.44%)			$	37,518.32
Construction Testing/Monitoring (CQA, 0.33%)				$	5,074.20
		Contract Admin (0.68%)		$	1,045.59
			Admin (5.61%)	$	86,261.38
Env & Permitting - Support and Reviews (5.61%)				$	86,261.38
	Env & Permitting - Legal (1.12%)			$	17,221.52
Env & Permitting - Agency Oversight/Permit (0.33%)				$	5,074.20
	Subtotal PMG and Other Soft Costs			**$**	**2,059,940.29**
		Art Program (0.66%)		$	135.96
	Annual Maintenance (10 years)			$	85,495.49
Corrective Measure Contingency (10% construction subtotal)				$	109,923.76
	Annual Monitoring (10 years)			$	1,472,111.89
TOTAL PROJECT ESTIMATED PROGRAM COST				**$**	**3,727,607.39**

Costs are in 2018 dollars. Escalation for 2019/2020 construction is recommended at 5% per year.

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MU 46 - Tyee Golf Course Mitigation Construction Opinion of Probable Costs

Item	Quantity	Unit	Unit Cost	Subtotal
Site Preparation				
TESC measures	1	LS	$ 113,400.00	$ 113,400
Demolish existing concrete paving	164,103	LS		
Demolish existing crushed gravel surfacing	24,583	SF	$ 0.60	$ 14,750
Mow reed canary grass	21,479	SF	$ 0.05	$ 1,074
Clear and grub existing vegetated areas	1,799,163	SF	$ 0.20	$ 359,833
Earthwork				
Cut and stockpile existing topsoil (1-ft depth, outside of existing developed area and areas with RCG)	126,134	CY	$ 10.50	$ 1,324,406
Cut and fill for wetland creation (average 3.5-ft depth, remove volume of salvaged topsoil in wetland creation area; includes over-excavation). Place fill in buffer area	122,858	CY	$ 10.50	$ 1,290,005
Cut and stockpile wetland enhancement area to remove reed canary grass (12" depth)	796	CY	$ 9.00	$ 7,160
Haul and dispose of wetland enhancement area to remove reed canary grass	796	CY	$ 33.00	$ 26,252
Procure, place and compact wetland topsoil (12" depth, wetland creation area only)	35,102	CY	$ 42.00	$ 1,474,284
Procure, place and compact wetland topsoil (12" depth, wetland RCG enhancement area only)	796	CY	$ 42.00	$ 33,412
Place and compact on-site stockpiled topsoil in buffer (12" depth, buffer only)	126,134	CY	$ 11.50	$ 1,450,540
Planting and Irrigation				
Procure and install coniferous tree (1 gallon, 10' O.C.)	5,699	EA	$ 19.85	$ 113,097
Procure and install deciduous trees (1 gallon, 10')	4,716	EA	$ 19.85	$ 93,589
Procure and install shrub (1 gallon, 6' O.C.)	24,547	EA	$ 19.85	$ 487,135
Procure and install livestake (3' O.C.)	52,331	EA	$ 3.00	$ 156,993
Procure and install emergent (2' O.C.)	0	EA	$ 6.00	$ -
Haul and place mulch (4" depth)	23,099	CY	$ 42.00	$ 970,177
Install temporary irrigation (created/enhanced wetland and buffer)	1,871,057	SF	$ 2.20	$ 4,116,324
		Subtotal Construction		**$ 12,032,430**
			Mobilization (10%)	$ 1,203,243
	Subtotal Construction Direct Costs			**$ 13,235,673**

Design Development Allowance (5%)	$	661,784
Escalation (Calc to mid-point of const 12/31/21, 5% per year)		
GC's. Home Office, Bond and Profit (0%)	$	-
Estimated Construction Bid Amount	$	13,897,456
Major Construction Contingency (10%)	$	1,389,746
Subtotal Construction Costs with ODCs & Contingency (for Soft Cost basis)	$	15,287,202
WA State Sales Tax: Major Construction (10.1%)	$	1,544,007
WA State Sales Tax: PCS (9.5%)	$	-
Subtotal Construction + Mobilization + Contingencies + Tax	**$**	**16,831,209**
Design - POS Design Mgmt $& Suipport (4.49%)	$	755,721.30
Design - A/E Support (3.36%)	$	565,528.64
PM (Design & Constr, 3.93%)	$	661,466.53
PM Commissioning (0%)	$	-
CM (4.57%)	$	769,186.27
Eng Admin (1.12%)	$	188,509.55
Health & Safety (0.28%)	$	47,127.39
Safety (0.11%)	$	18,514.33
Designer Const Support (0.60%)	$	100,987.26
Envr Constr Support (2.44%)	$	410,681.51
Construction Testing/Monitoring (CQA, 0.33%)	$	55,542.99
Contract Admin (0.68%)	$	11,445.22
Admin (5.61%)	$	944,230.85
Env & Permitting - Support and Reviews (5.61%)	$	944,230.85
Env & Permitting - Legal (1.12%)	$	188,509.55
Env & Permitting - Agency Oversight/Permit (0.33%)	$	55,542.99
Subtotal PMG and Other Soft Costs	**$**	**22,548,434.58**
Art Program (0.66%)	$	1,488.20
Annual Maintenance (10 years)	$	187,951.57
Corrective Measure Contingency (10% construction subtotal)	$	1,203,242.97
Annual Monitoring (10 years)	$	4,196,485.67
TOTAL PROJECT ESTIMATED PROGRAM COST	**$**	**28,137,602.99**

Costs are in 2018 dollars. Escalation for 2019/2020 construction is recommended at 5% per year.

In providing opinions of probable construction cost, the Client understands that the Consultant (Anchor QEA L.L.C.) has no control over the cost or availability of labor, equipment or materials, or over market condition or the Contractor's method of pricing, and the consultant's opinions of probable construction costs are made on the basis of the Consultant's professional judgment and experience. The Consultant makes no warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from the Consultant's opinion of probable construction cost.

MU 48 - Auburn SIte Mitigation Construction Opinion of Probable Costs

Item	Quantity	Unit	Unit Cost	Subtotal
Site Preparation				
TESC measures	1	LS	$ 43,000.00	$ 43,000
Mow reed canary grass	351,529	SF	$ 0.05	$ 17,576
Clear and grub existing vegetated areas	200,000	SF	$ 0.20	$ 40,000
Earthwork				
Cut and haul existing topsoil from wetland enhancement and wetland creation areas to remove reed canary grass (6" depth)	24,966	CY	$ 9.00	$ 224,697
Haul and dispose of stockpiled topsoil to remove reed canary grass	24,966	CY	$ 33.00	$ 823,889
Cut and fill for wetland creation (average 2.5-ft depth, includes over-excavation). Place fill in buffer area	59,734	CY	$ 10.50	$ 627,204
Procure, place and compact wetland topsoil (12" depth, wetland creation area)	23,893	CY	$ 42.00	$ 1,003,506
Procure, place and compact wetland topsoil (12" depth, wetland RCG enhancement area)	13,020	CY	$ 42.00	$ 546,823
Procure, place and compact topsoil (12" depth, buffer enhancement area)	19,715	CY	$ 42.00	$ 828,027
Planting and Irrigation				
Procure and install coniferous tree (1 gallon, 10' O.C.)	3,718	EA	$ 19.85	$ 73,784
Procure and install deciduous trees (1 gallon, 10')	3,104	EA	$ 19.85	$ 61,599
Procure and install shrub (1 gallon, 6' O.C.)	11,215	EA	$ 19.85	$ 222,562
Procure and install livestake (3' O.C.)	24,371	EA	$ 3.00	$ 73,113
Procure and install emergent (2' O.C.)	115,087	EA	$ 4.00	$ 460,348
Haul and place mulch (3" depth)	14,157	CY	$ 42.00	$ 594,594
Install waterfowl exclusion system	398,661	SF	$ 1.50	$ 597,992
Install salvaged habitat logs	25	EA	$ 350.00	$ 8,750
Install temporary irrigation (created/enhanced wetland and buffer)	1,528,956	SF	$ 1.00	$ 1,528,956
	Subtotal Construction			**$ 7,776,419**
			Mobilization (10%)	$ 777,642
	Subtotal Construction Direct Costs			**$ 8,554,061**
	Design Development Allowance (5%)			$ 427,703
Escalation (Calc to mid-point of const 12/31/21, 5% per year)				
GC's. Home Office, Bond and Profit (0%)				$ -
	Estimated Construction Bid Amount			$ 8,981,764

Major Construction Contingency (10%)	$	898,176
Subtotal Construction Costs with ODCs & Contingency (for Soft Cost basis)	$	9,879,941
WA State Sales Tax: Major Construction (10.1%)	$	997,874
WA State Sales Tax: PCS (9.5%)	$	-
Subtotal Construction + Mobilization + Contingencies + Tax	**$**	**10,877,815**
Design - POS Design Mgmt $& Suipport (4.49%)	$	488,413.88
Design - A/E Support (3.36%)	$	365,494.58
PM (Design & Constr, 3.93%)	$	427,498.12
PM Commissioning (0%)	$	-
CM (4.57%)	$	497,116.13
Eng Admin (1.12%)	$	121,831.53
Health & Safety (0.28%)	$	30,457.88
Safety (0.11%)	$	11,965.60
Designer Const Support (0.60%)	$	65,266.89
Envr Constr Support (2.44%)	$	265,418.68
Construction Testing/Monitoring (CQA, 0.33%)	$	35,896.79
Contract Admin (0.68%)	$	7,396.91
Admin (5.61%)	$	610,245.41
Env & Permitting - Support and Reviews (5.61%)	$	610,245.41
Env & Permitting - Legal (1.12%)	$	121,831.53
Env & Permitting - Agency Oversight/Permit (0.33%)	$	35,896.79
Subtotal PMG and Other Soft Costs	**$**	**14,572,790.85**
Art Program (0.66%)	$	961.80
Annual Maintenance (10 years)	$	152,100.00
Corrective Measure Contingency (10% construction subtotal)	$	777,641.93
Annual Monitoring (10 years)	$	2,818,970.84
TOTAL PROJECT ESTIMATED PROGRAM COST	**$**	**18,322,465.43**

Costs are in 2018 dollars. Escalation for 2019/2020 construction is recommended at 5% per year.

In providing opinions of probable construction cost, the Client understands that the Consultant (Anchor QEA L.L.C.) has no control over the cost or availability of labor, equipment or materials, or over market condition or the Contractor's method of pricing, and the consultant's opinions of probable construction costs are made on the basis of the Consultant's professional judgment and experience. The Consultant makes no warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from the Consultant's opinion of probable construction cost.

Appendix B
FLAT Sample Field Form

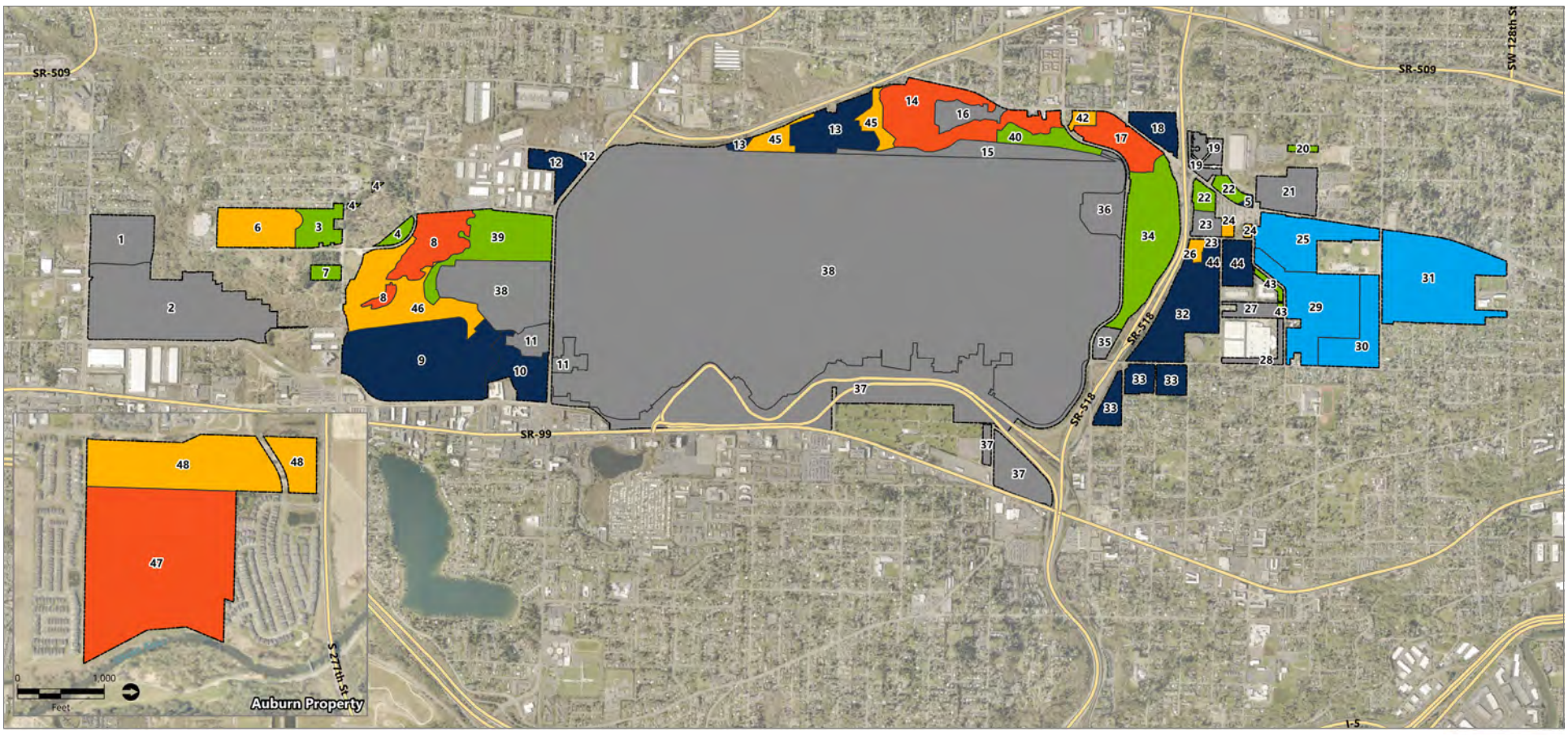
Table B-1
Data Attributes

Data Attributes	Yes/No	Estimate	Notes
Land Cover Designation			
Is the actual land cover consistent with land cover designation for MU?			
Is the actual land cover consistent with land cover designation?			
Forest Values			
Does the MU have >25% native tree canopy cover?			
Does the MU have <25% native tree canopy cover?			
Does the site have 0% conifer or madrone?			
Does the site have 1% to 50% conifer or madrone?			
Does the site have >50% conifer or madrone?			
Is the site able to support >50% conifer or madrone cover?			
Is the site able to support 1% to 50% conifer or madrone cover?			
Is the site unable to support conifer or madrone cover?			

Appendix C
Land Stewardship Plan Mapfolio

Land Stewardship Plan: Appendix C

Land Stewardship Mapfolio



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Recommended Site Action Key

Public Safety and Maintenance

Ecological Use: Habitat Enhancement

Ecological Use: Existing Mitigation

Ecological Use: Potential Mitigation

North SeaTac Park

MUs categorized as North SeaTac Park are not included in this appendix but are listed here for reference

MU 25
MU 29
MU 30
MU 31

No Action

MUs categorized as No Action are not included in this appendix but are listed here for reference

MU 1
MU 2
MU 11
MU 15
MU 16
MU 19
MU 21
MU 23
MU 27
MU 28
MU 32
MU 35
MU 36
MU 37
MU 38

Abbreviations

AOA	Airport Operations Area
FLAT	Forest Landscape Assessment Tool
FCSP	Flight Corridor Safety Program
LSP	Land Stewardship Plan
MU	Management Unit
ROW	right-of-way
RPZ	Runway Protection Zone
RDF	Regional Detention Facility
RSA	Runway Safety Area
SEA	Seattle-Tacoma International Airport

Notes

1. SEA property and lease data were provided by the Port of Seattle.
2. SEA natural resources data were provided by the Port of Seattle and managed by Anchor QEA. Jurisdictional critical areas were provided by each jurisdiction (Des Moines, SeaTac, and Burien).
3. Aerial imagery provided by King County 2021
4. Critical areas shown include streams, stream buffers, confirmed wetlands, wetland buffers, lakes and ponds, and steep slopes. Erosion hazards, landslide hazards, seismic hazards, liquefaction susceptibility, jurisdictional ditches, and other areas are not shown.
5. Culvert location data were provided by the Port of Seattle.
6. MUs are all within the SEA boundary. Recommendations and actions are only made for Port-owned aviation properties.

Management Unit 3

Borrow Site North and P-5

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Enhance Habitat
- Remove invasive vegetation
- Install forest and understory planting communities
- Improve forest structural complexity

Protect Infrastructure
- Prevent hazards, including treefall, along ROWs, along neighboring houses, and adjacent to cemetery
- Prevent establishment of future obstructions

Community Benefits
- Maintain community access
- Plant along visual corridors

Habitat Corridor
- Improve habitat within Des Moines Creek habitat corridor

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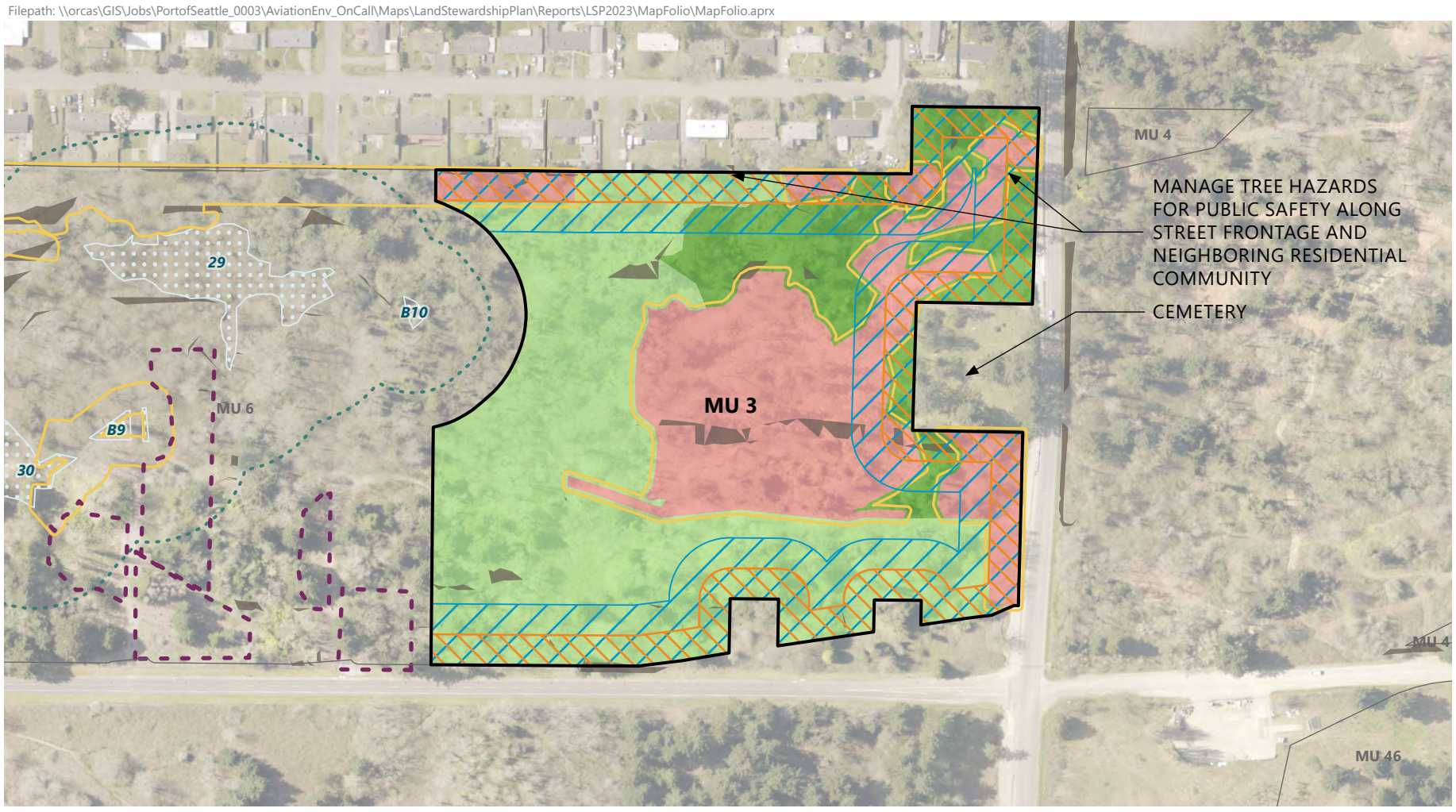
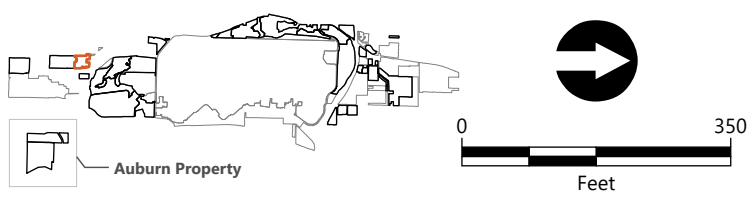


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- FCSP Mitigation Site
- Community Planting Area
- Slope > 40%
- Wetland
- Wetland Buffer

Stewardship Opportunity Area
- Enhance Degraded Habitat
- Protect Habitat
- Conduct Long-Term Mitigation Action



Site Description

- MU 3 is the northern portion of the South 200th Street Development Area (Borrow Site). This MU is not currently planned for development, but future development is possible.
- This MU is a previous residential development with some roadway infrastructure and remnant foundation walls.
- The neighboring community uses trails within the site. This MU presents an opportunity to engage the community for social justice benefit.
- The MU has a mix of mature conifers and deciduous trees.
- Much of the MU's understory is dominated by Himalayan blackberry and English ivy. English ivy is threatening many of the mature trees.
- FCSP mitigation planting occurred on the site in 2014 and has ongoing management and prevention actions. The Port is monitoring replanting performance.
- The Port removed obstructions on this MU in 2018 (FCSP Site P-5). FCSP mitigation planting occurred in 2018/19.

Site Acreage

15.9 Acres

Land Cover Analysis

0%	Buildings
0%	Impervious
5.3%	Dry Grass/Bare
83.5%	Forest
2.2%	Grass
8.9%	Shrub
0%	Water

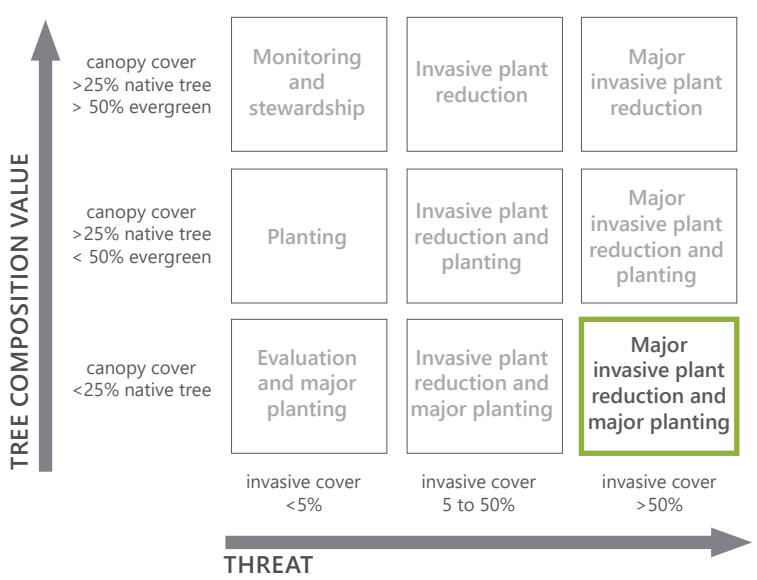
Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F

Equity Score: Very Low

FLAT Assessment: Landscape Management Strategy

Adapted from Green Seattle Partnership (Ciecko et al. 2016)



Management Unit 4

Remnant Parcels

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Enhance Habitat

- Remove invasive vegetation
- Install forest and understory planting communities
- Improve forest structural complexity

Protect Infrastructure

- Prevent hazards, including treefall, along ROWs
- Prevent establishment of future obstructions

Community Benefits

- Maintain community access
- Plant along visual corridors

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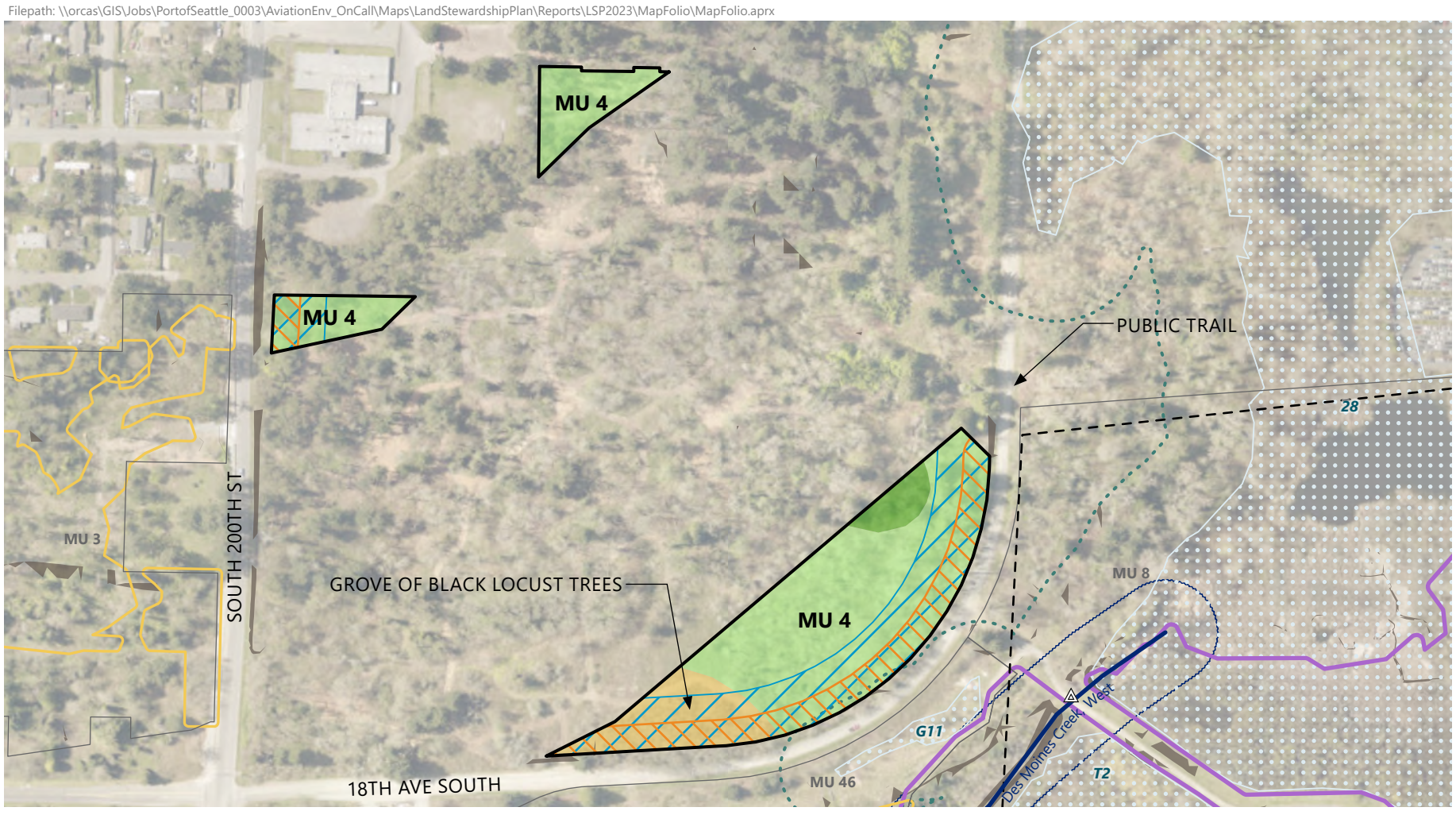
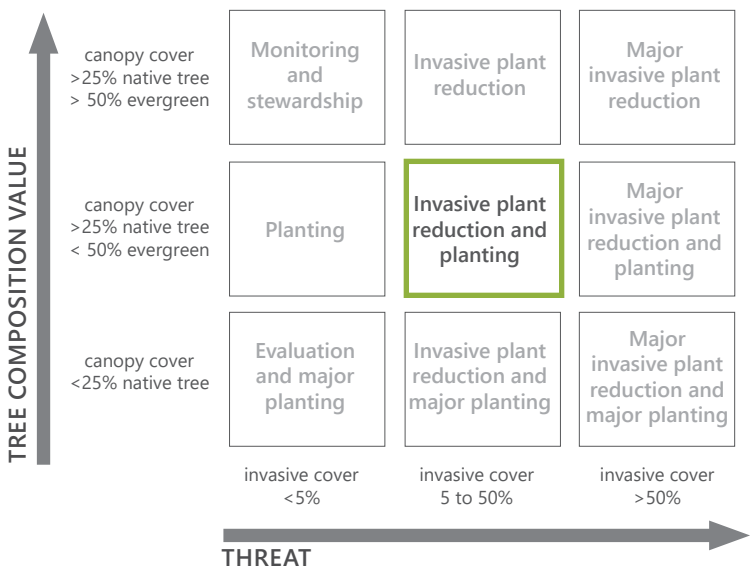


Site Description

- MU 4 is comprised of three remnant sections of land at the south end of the SEA runway across from the former Tyee Golf Course. This MU is not currently planned for development.
- A trail borders the northeast section of the site. The neighboring community utilizes the trail as a scenic walking and cycling trail.
- The MU has a mix of mature native coniferous and deciduous trees, including bigleaf maples, douglas fir, Western red cedar, cottonwood, and several varieties of willow.
- The majority of the southeast corner of the site is vegetated with invasive mature black locust trees and Himalayan blackberry in areas with minimal shade.
- Throughout the remainder of the site, the understory is dominated by Himalayan blackberry and English ivy. English ivy is threatening many of the mature trees.
- Small portions of the site, away from the roadway, are mostly free of invasive species and are vegetated with a deciduous native understory made up of bracken and sword ferns, salmonberry, salal, snowberry, beaked hazelnut, dogwood, willow, and vine maple.

FLAT Assessment: Landscape Management Strategy

Adapted from Green Seattle Partnership (Ciecko et al. 2016)



Site Acreage

4.4 Acres

Land Cover Analysis

0%	Buildings
0.1%	Impervious
0%	Dry Grass/Bare
87.7%	Forest
0.8%	Grass
11.4%	Shrub
0%	Water

Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Very Low

Management Unit 5

Williams Property Development

LSP Action

Public Safety and Maintenance

Recommended Site-Based Management Actions

Protect Infrastructure

- Prevent hazards, including treefall, along ROWs

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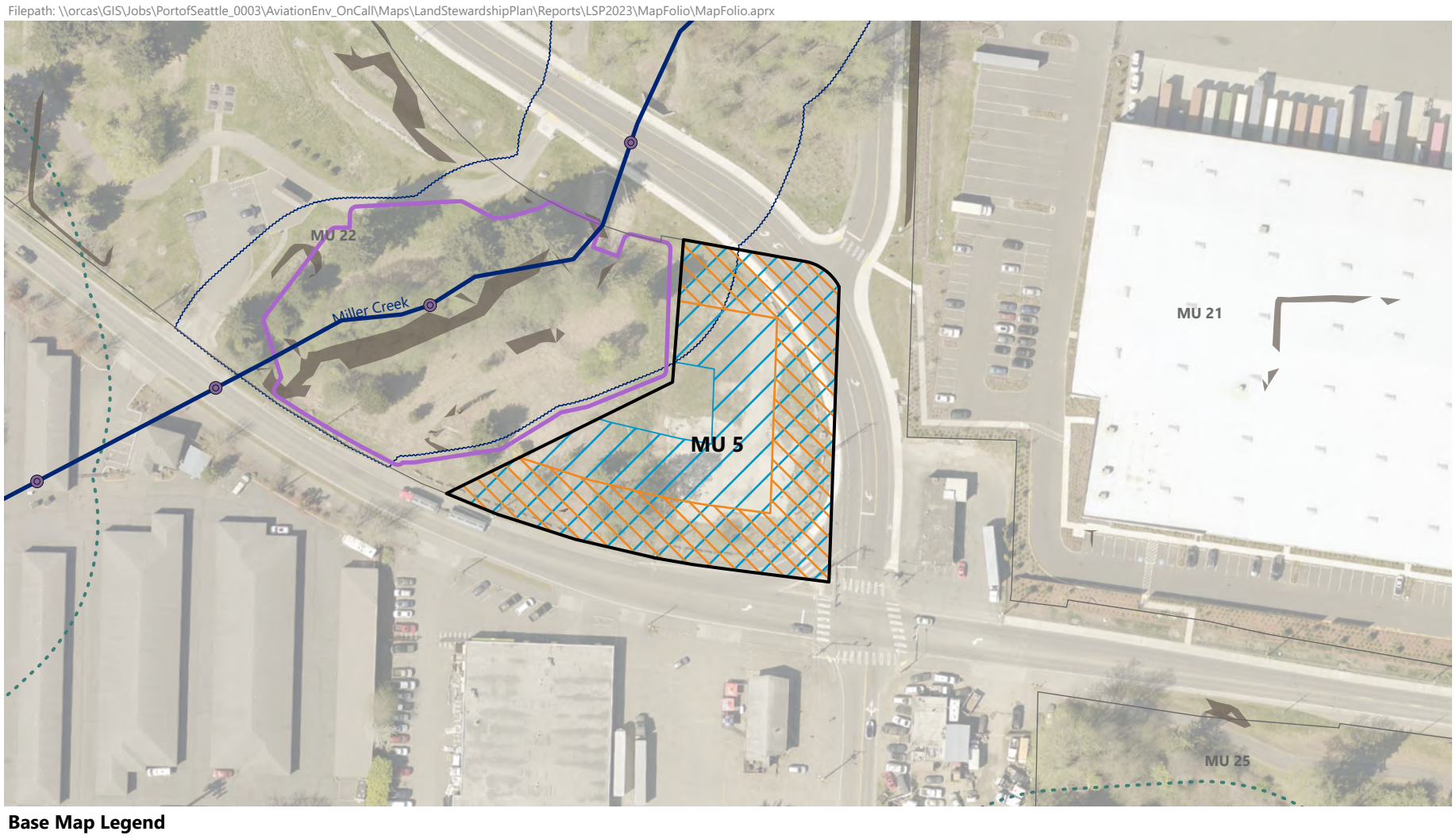
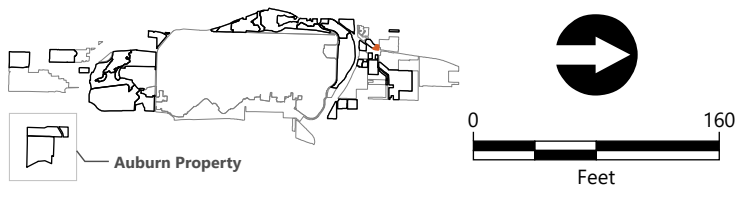


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- Slope > 40%
- Stream
- Stream Buffer
- Wetland Buffer

Culverts

- Fish Passable



Site Description

- MU 5 is a leased site located north of SEA Operational areas.
- Miller Creek runs south of the MU and a mitigation restrictive covenant borders the south portion of the site. The north, east, and west edges of the site are bounded by paved roadways.

FLAT Assessment: Landscape Management Strategy

MU 5 is identified as public safety and maintenance and therefore did not receive a FLAT assessment.

Site Acreage

1.2 Acres

Land Cover Analysis

0%	Buildings
14.7%	Impervious
7.8%	Dry Grass/Bare
9.9%	Forest
62.9%	Grass
4.7%	Shrub
0%	Water

Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Very Low

Management Unit 6

Borrow Site Study Area

LSP Action

Ecological Use: Potential Mitigation

Recommended Site-Based Management Actions

Identify mitigation opportunities

- Establish advanced mitigation sites
- Potential tree stewardship mitigation (invasive removal, high-value tree protection and planting)

Provide Opportunity for Community Outreach

- Community planting area
- Maintain community planting area
- Establish new community planting areas with community events

Habitat Corridor

- Improve habitat within Des Moines Creek habitat corridor

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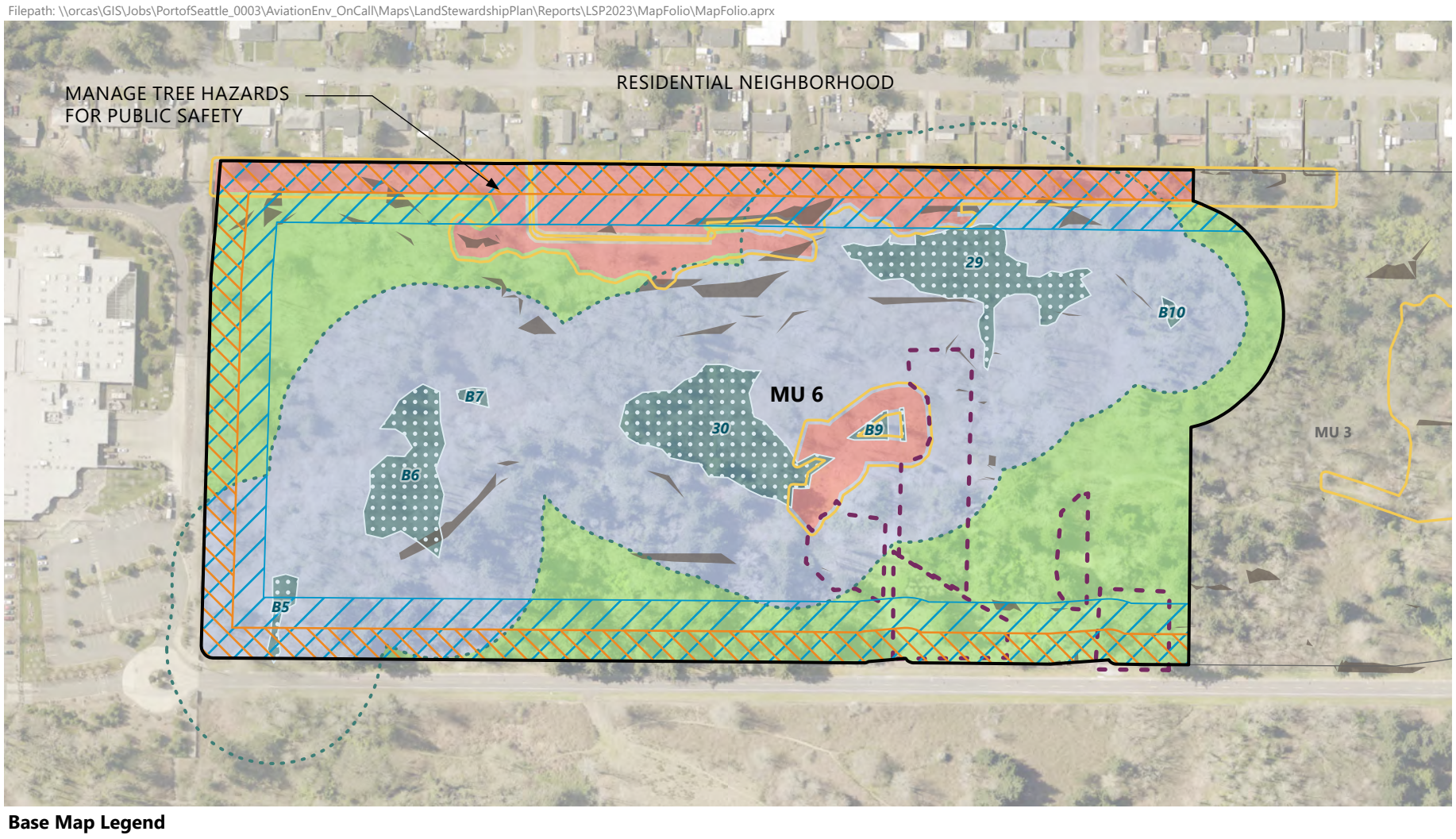
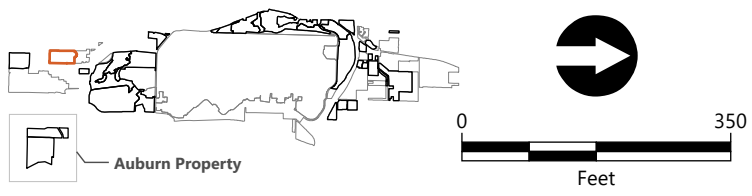


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- FCSP Mitigation Site
- Community Planting Area
- Slope > 40%
- Wetland
- Wetland Buffer

Stewardship Opportunity Area

- Enhance Degraded Habitat
- Enhance Wetland Buffer
- Preserve Wetland
- Conduct Long-Term Mitigation Action



Site Description

- MU 6 is in the city of SeaTac. It and zoned Aviation Commercial.
- A portion of the site is designated for mitigation and is planted with native species. The rest of the unit outside of wetlands, buffers, or mitigation areas has limited development potential.
- There are seven wetlands and buffers within MU 6: B5, B6, B7, B9, B10, 29, and 30.
- Within Wetland 29 and its buffer, there is an FCSP mitigation planting area.
- The wetlands are vegetated with deciduous understory, native mature forest, and limited invasive species.
- Invasive species including English ivy and HImalayan blackberry are pervasive throughout the MU, threatening mature trees and impairing forest health.
- MU 6 has community access with informal entrances along the MU's perimeter and a network of trails.

FLAT Assessment: Landscape Management Strategy

MU 6 is addressed in further detail in the *Mitigation Site Opportunity Assessment* and therefore did not receive a FLAT assessment.

Site Acreage

31 Acres

Land Cover Analysis

0%	Buildings
0.9%	Impervious
0.2%	Dry Grass/Bare
81.8%	Forest
2.7%	Grass
14.4%	Shrub
0%	Water

Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Very Low

Management Unit 7

P-4

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Enhance Habitat
- Remove invasive vegetation
- Install forest and understory planting communities consistent with Airport operations
- Improve forest structural complexity
- Maintain existing mitigation site

Manage and Prevent Hazards
- Prevent hazards, including treefall, along ROWs and public trails
- Prevent future obstructions from establishing

Community Benefits
- Maintain community access
- Plant along visual corridors

Habitat Corridor
- Improve habitat within Des Moines Creek habitat corridor

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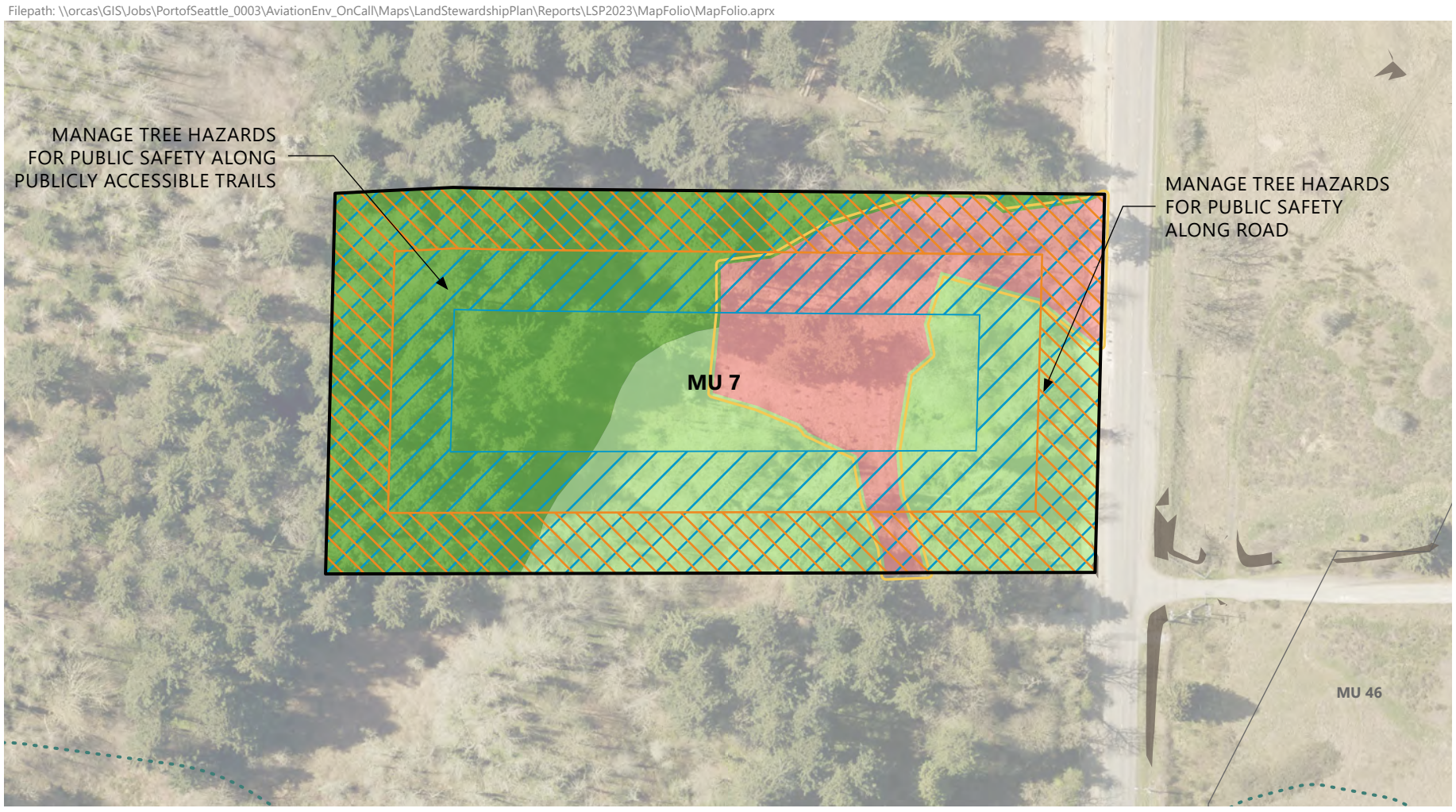
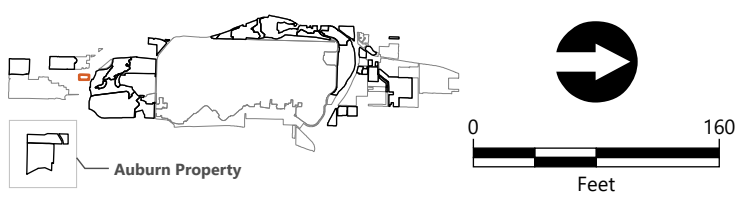


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- FCSP Mitigation Site
- Slope > 40%
- Wetland Buffer

Stewardship Opportunity Area
- Enhance Degraded Habitat
- Protect Habitat
- Conduct Long-Term Mitigation Action



Site Description

- SEA Properties identify MU 7 as South 5-acre parcel.
- This MU is adjacent to the Des Moines Creek Trail and much of it is open to community access.
- The Port identified obstructions on this MU and removed them in 2018 (FCSP Site P-4). FCSP mitigation planting is scheduled to occur on the site in 2018/2019.
- The northern portion of the MU adjacent to South 200 Street is heavily disturbed by Himalayan blackberry and has limited forest cover. The southern half is dominated by a mature conifer forest with an understory dominated by native shrubs and ground covers.

Site Acreage

4.5 Acres

Land Cover Analysis

0%	Buildings
0%	Impervious
0%	Dry Grass/Bare
87.1%	Forest
1.9%	Grass
11%	Shrub
0%	Water

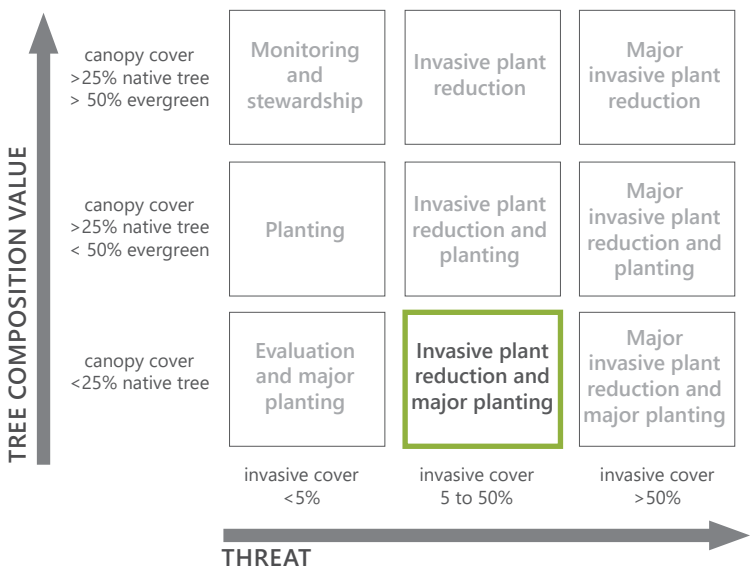
Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Very Low

FLAT Assessment: Landscape Management Strategy

Adapted from Green Seattle Partnership (Ciecko et al. 2016)



Management Unit 8

Tyee Golf Course

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Identify Mitigation Opportunities
- Wetland and wetland buffer mitigation along Des Moines Creek
- Install forest and understory planting communities
- Potential tree stewardship mitigation (invasive removal, high-value tree protection and planting)

Connect Habitat
- Connect habitat to adjacent habitat corridors

Manage and Prevent Hazards
- Manage and prevent obstructions or hazards within FCSP areas
- Prevent hazards, including treefall, along ROWs

Habitat Corridor
- Improve habitat within Des Moines Creek habitat corridor

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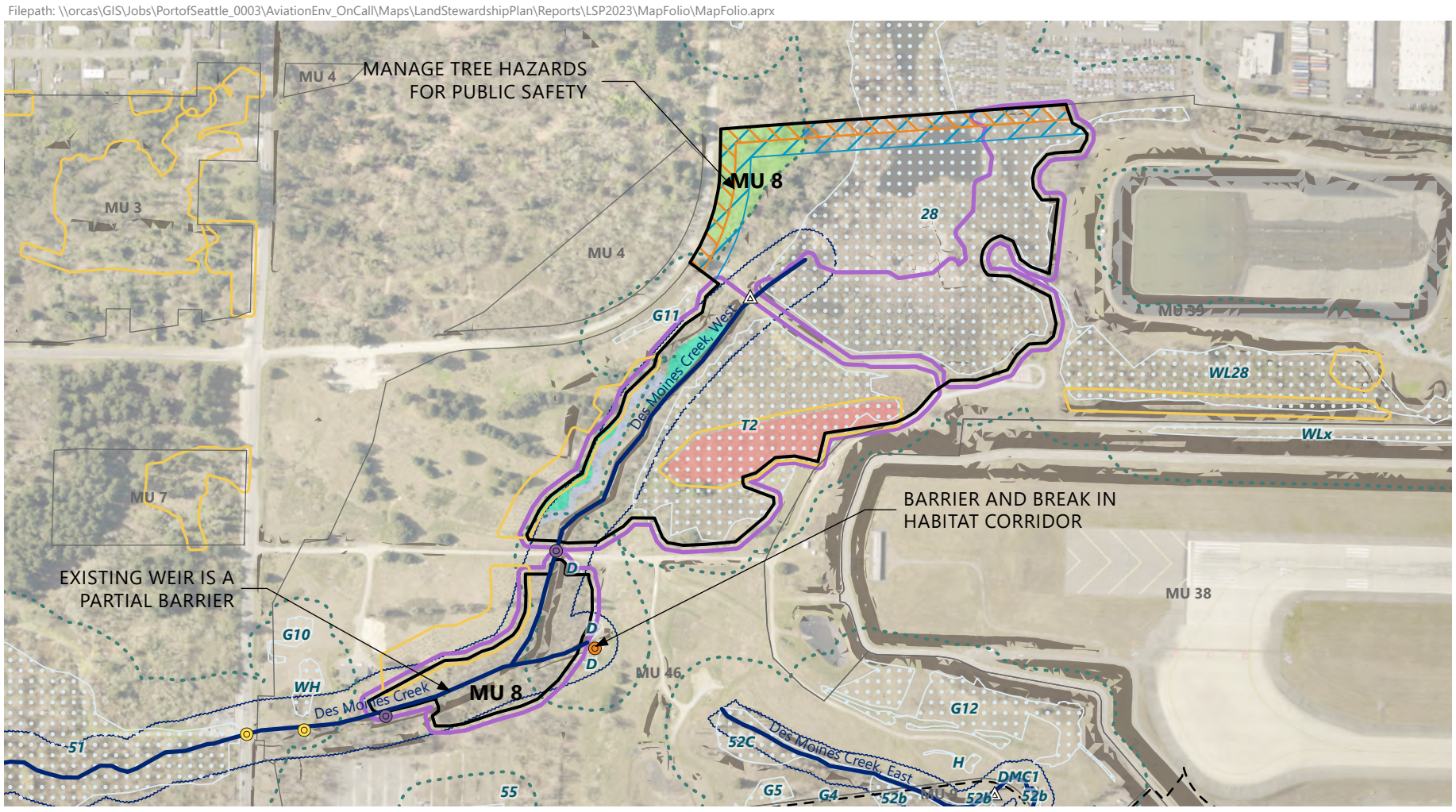

Site Description

- MU 8 is the former Tyee Golf Course. It is immediately south and adjacent to the AOA.
- This MU is inside the RSA and is not available for development, but the MU boundary is set by adjacent planned development.
- The east and west forks of Des Moines Creek are within this MU. Barriers include a weir passage and the Tyee Pond outlet/diversion.
- There are multiple existing wetlands within MU 8.
- Two mitigation areas (Tyee Golf Course and Des Moines RDF) are in the central portion of the MU.
- An FCSP mitigation planting area is located along the southern boundary of the mitigation area.
- The Port is considering mitigation opportunities on this MU including expanding and creating new wetlands along Des Moines Creek.
- The MU includes SEA operational areas such as light towers, stormwater ponds, and utility infrastructure. There are multiple access roads and a large parking area. As a former golf course, much of the MU is mowed grass.

FLAT Assessment: Landscape Management Strategy

MU 8 is identified for Mitigation Opportunity and did not undergo a FLAT assessment

Site Acreage

35 Acres

Land Cover Analysis

0%	Buildings
1%	Impervious
0.4%	Dry Grass/Bare
29.5%	Forest
9.9%	Grass
50.8%	Shrub
8.5%	Water

Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F)

Equity Score: Very Low

Management Unit 9

SASA

LSP Action

Public Safety and Maintenance

Recommended Site-Based Management Actions

Manage and Prevent Hazards

- Prevent operational hazards (e.g., wildlife, obstructions)

Protect Infrastructure

- Prevent hazards, including treefall, along ROWs

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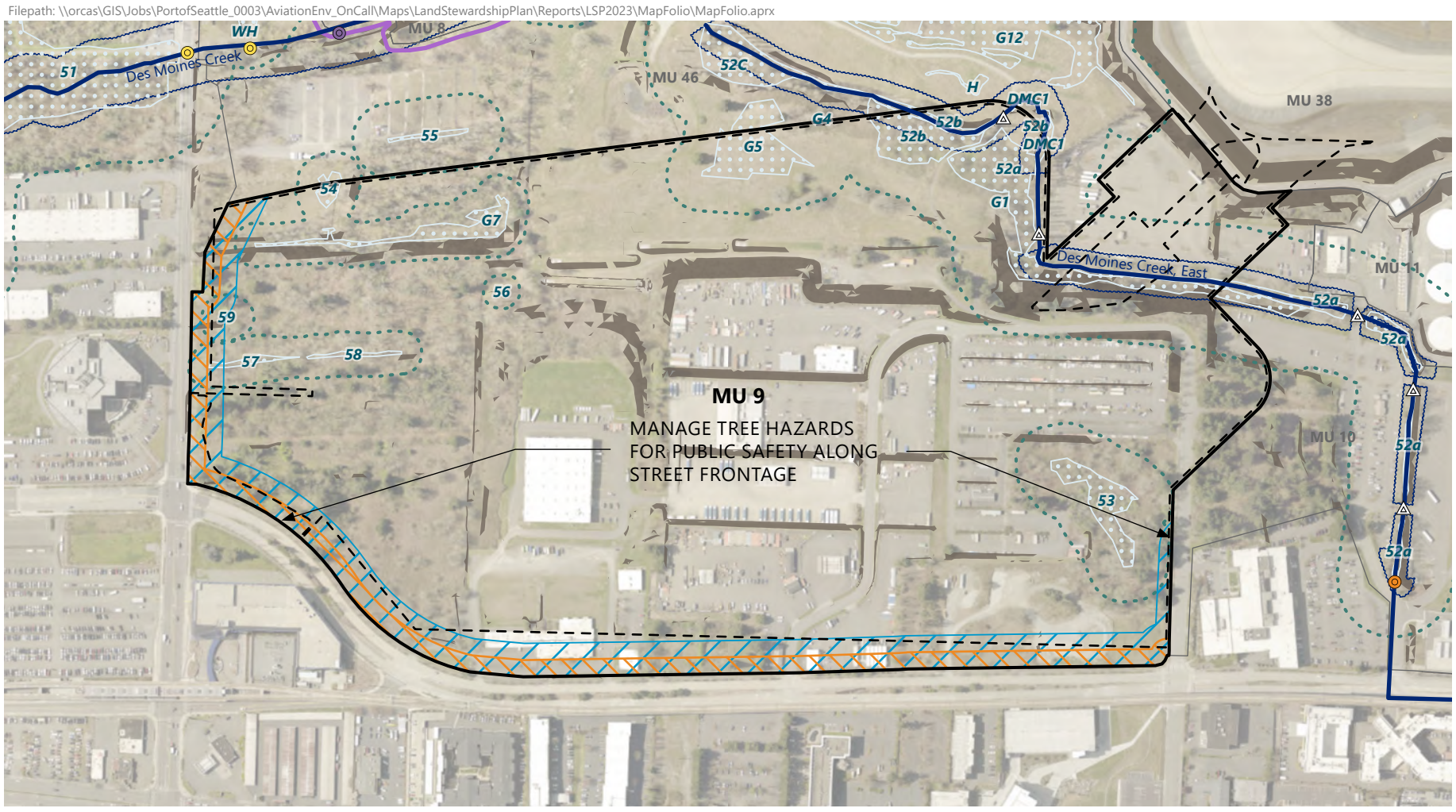
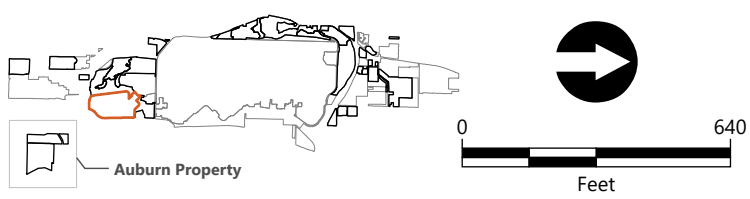


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Culverts

- Fish Passable
- Partial Fish Barrier
- Full Fish Barrier
- Unknown



Site Description

- MU 9 is developed with multiple Port operational areas, including construction parking and the Neighborhood Field Office.
- Two areas are leased by Clean Energy Fuels Corporation and Elcon Corporation. Future development will affect MU 9.
- A tributary of Des Moines Creek runs in a linear ditch with a narrow riparian corridor through a portion of MU 9.
- Wetlands 52a and 53 are located within MU 10. Wetland 52a is associated with the tributary of Des Moines Creek.
- MU 9 is not a FCSP area.

FLAT Assessment: Landscape Management Strategy

MU 9 is identified as public safety and maintenance and therefore did not undergo a FLAT assessment.

Site Acreage

104.8 Acres

Land Cover Analysis

3.5%	Buildings
30.6%	Impervious
3.2%	Dry Grass/Bare
28%	Forest
20.2%	Grass
14.5%	Shrub
0%	Water

Morning Heat Index Results:

High Heat Index (average exceeds 62.6 degrees F)

Equity Score: Very Low

Management Unit 10

North of SASA

LSP Action

Public Safety and Maintenance

Recommended Site-Based Management Actions

Manage and Prevent Hazards

- Prevent operational hazards (e.g., wildlife, obstructions)

Protect Infrastructure

- Prevent hazards, including treefall, along ROWs

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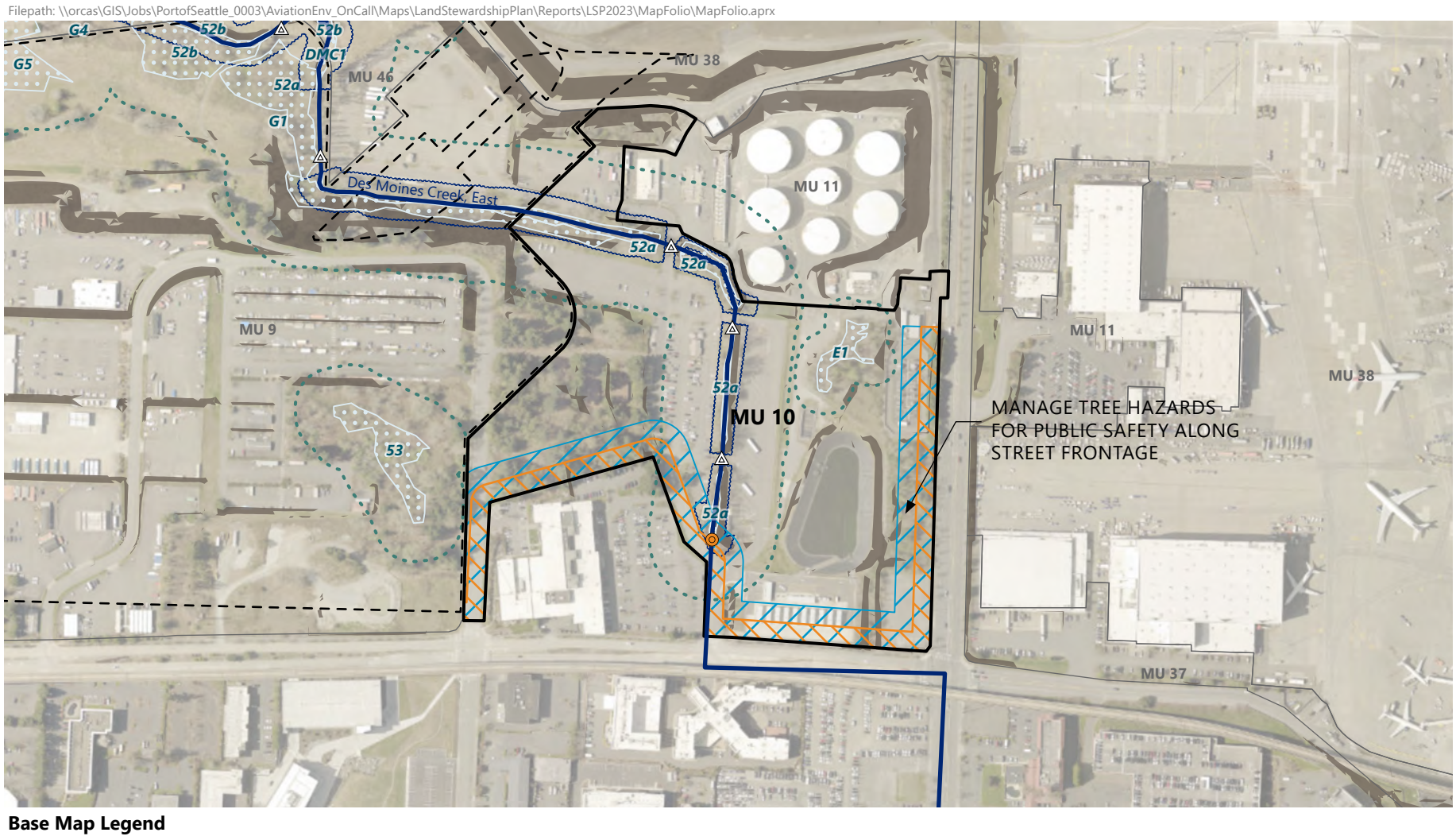
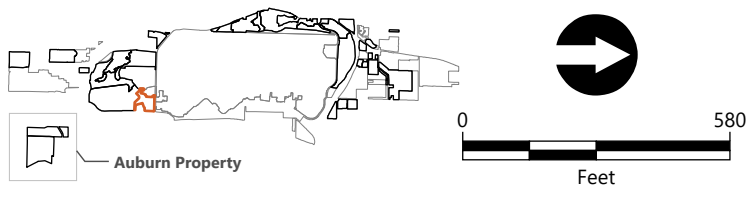


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Culverts

- Full Fish Barrier
- Unknown



Site Description

- MU 10 supports SEA operations, including a fuel farm and an alternate utility facility. MU 10 will be affected by future airport development.
- Wetland E1 is within MU 10. This small wetland is surrounded by development and will likely be affected by future airport development. There may be an opportunity to protect/enhance the wetland.
- A small tributary of Des Moines Creek runs through MU 10, within a narrow vegetated corridor and flanked on both sides by asphalt pavement. There are 4 culverts along the creek within the MU.
- There may be opportunities for riparian corridor enhancement and Wetland E1 protection/enhancement; however due to future development potential, opportunities are not identified.

FLAT Assessment: Landscape Management Strategy

MU 10 is identified as public safety and maintenance and therefore did not undergo a FLAT assessment.

Site Acreage

24.1 Acres

Land Cover Analysis

1.2%	Buildings
42.5%	Impervious
3.5%	Dry Grass/Bare
30.3%	Forest
7.8%	Grass
7.6%	Shrub
7.1%	Water

Morning Heat Index Results:

High Heat Index (average exceeds 62.6 degrees F)

Equity Score: Very Low

Management Unit 12

34L RPZ

LSP Action

Public Safety and Maintenance

Recommended Site-Based Management Actions

Manage and Prevent Hazards

- Prevent operational hazards (e.g., wildlife, obstructions)
- Reduce invasive colonization through mowing

Protect Infrastructure

- Prevent future obstructions

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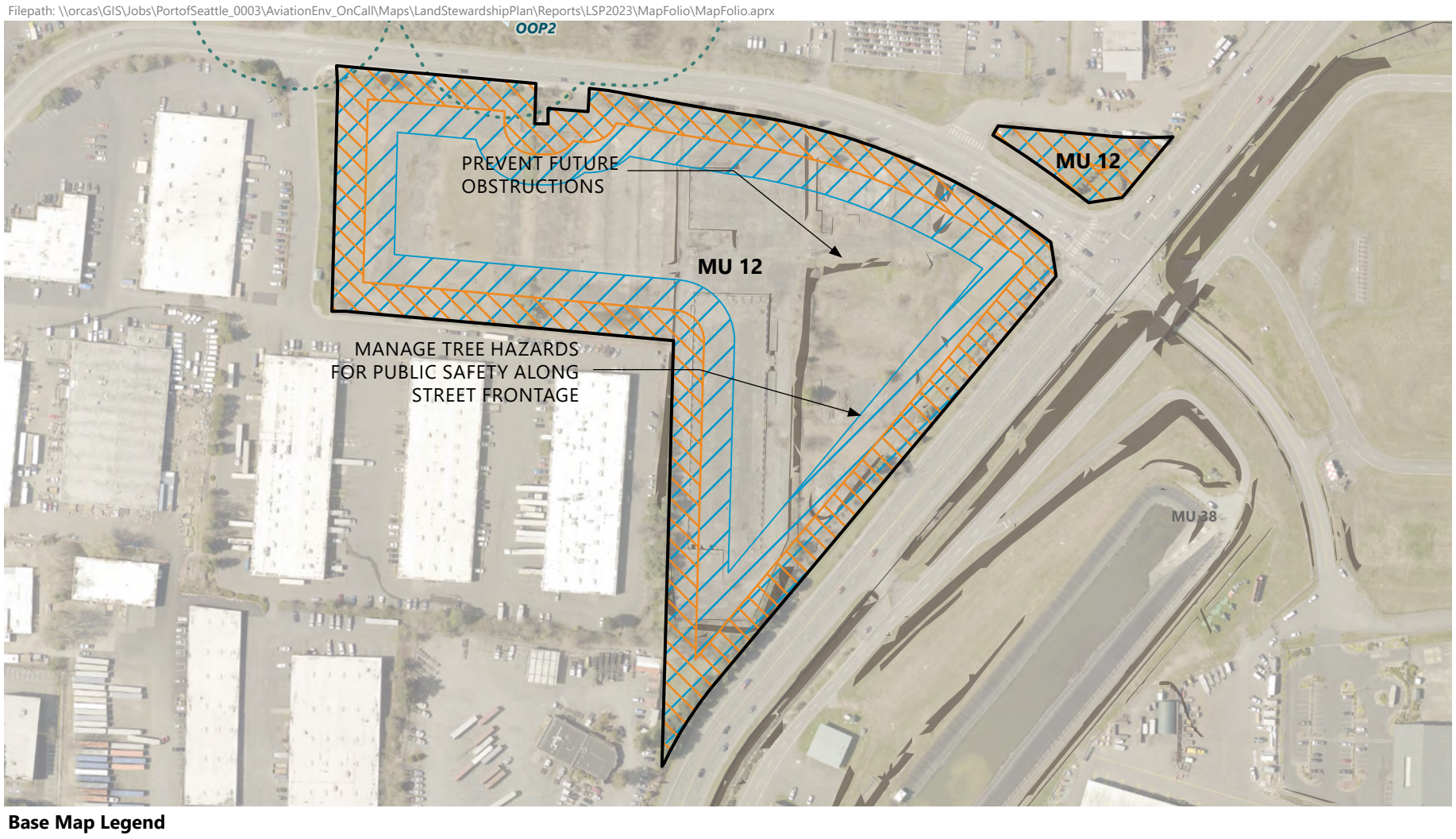
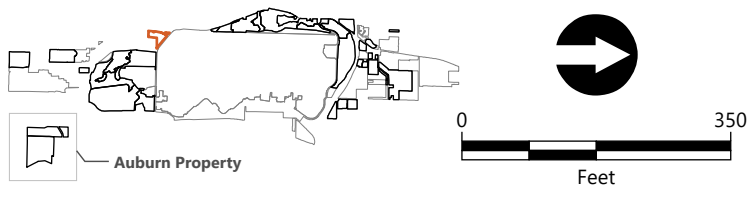


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Slope > 40%
- Wetland
- Wetland Buffer



Site Description

- MU 12 is within the RPZ, and limited to no development can occur in this location. It is slated for future infiltration stormwater ponds.
- The MU is currently covered in pavement with limited vegetation.

FLAT Assessment: Landscape Management Strategy

MU 12 is identified as public safety and maintenance and therefore did not undergo a FLAT assessment.

Site Acreage

13.9 Acres

Land Cover Analysis

0%	Buildings
58.6%	Impervious
1.1%	Dry Grass/Bare
5.5%	Forest
28.6%	Grass
6.4%	Shrub
0%	Water

Morning Heat Index Results:

High Heat Index (average exceeds 62.6 degrees F)

Equity Score: Low

Management Unit 13

West Side Campus

LSP Action

Public Safety and Maintenance

Recommended Site-Based Management Actions

Manage and Prevent Hazards

- Monitor trees and prevent future obstructions

Protect Infrastructure

- Remove invasive species
- Minimally replant with hydroseed

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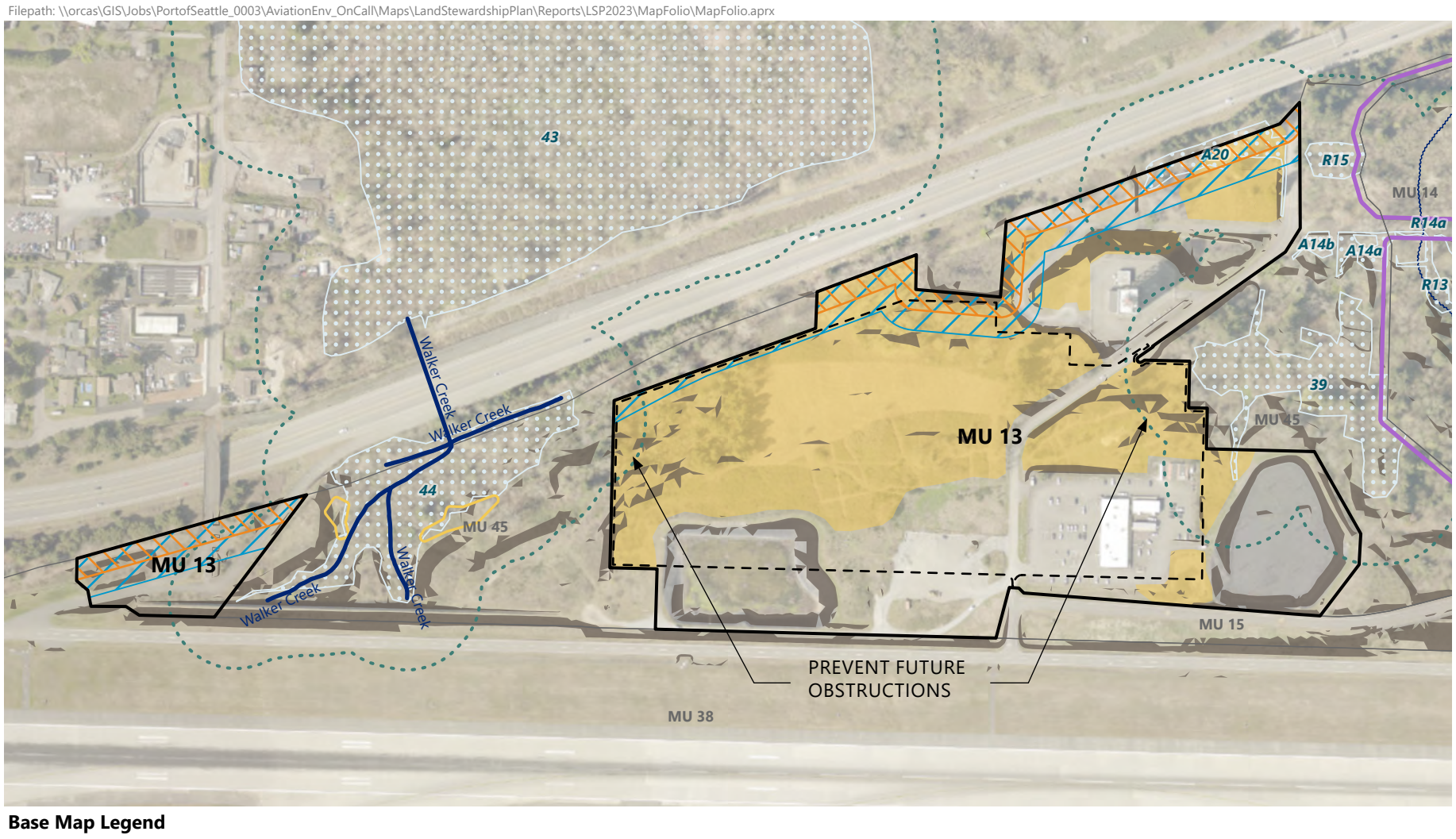
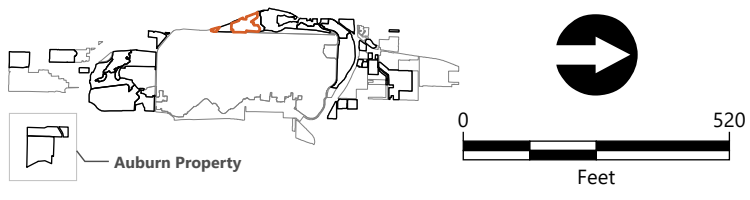


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- FCSP Mitigation Site
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Stewardship Opportunity Area

- Manage Invasive Species



Site Description

- MU 13 includes the West Side Field Office and surrounding development, including stormwater ponds. Future development will affect this MU.
- MU 13 also includes forested buffers for existing Wetlands 44a and 39.
- A small tributary of Walker Creek flows from the south side of MU 13 into a culvert below SR-509.

FLAT Assessment: Landscape Management Strategy

MU 13 is identified as public safety and maintenance and therefore did not undergo a FLAT assessment.

Site Acreage

34.5 Acres

Land Cover Analysis

1.6%	Buildings
16.8%	Impervious
2%	Dry Grass/Bare
21%	Forest
22.9%	Grass
24.3%	Shrub
11.5%	Water

Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F

Equity Score: Very Low

Management Unit 14

Miller Creek Buffer Mitigation Area

LSP Action

Ecological Use: Existing Mitigation

Recommended Site-Based Management Actions

Maintain Existing Mitigation Sites (long term)

- Remove invasive vegetation
- Monitor forest and provide maintenance as needed
- Remove culverts and daylight fish-passable channels
- Protect high-value trees
- Maintain invasive species at maximum 10% cover

Manage and prevent hazards

- Remove ivy from trees to prevent hazards where adjacent to street frontage and residential areas

Enhance Habitat

- Install forest and understory planting communities

Habitat Corridor

- Improve habitat within Miller Creek habitat corridor

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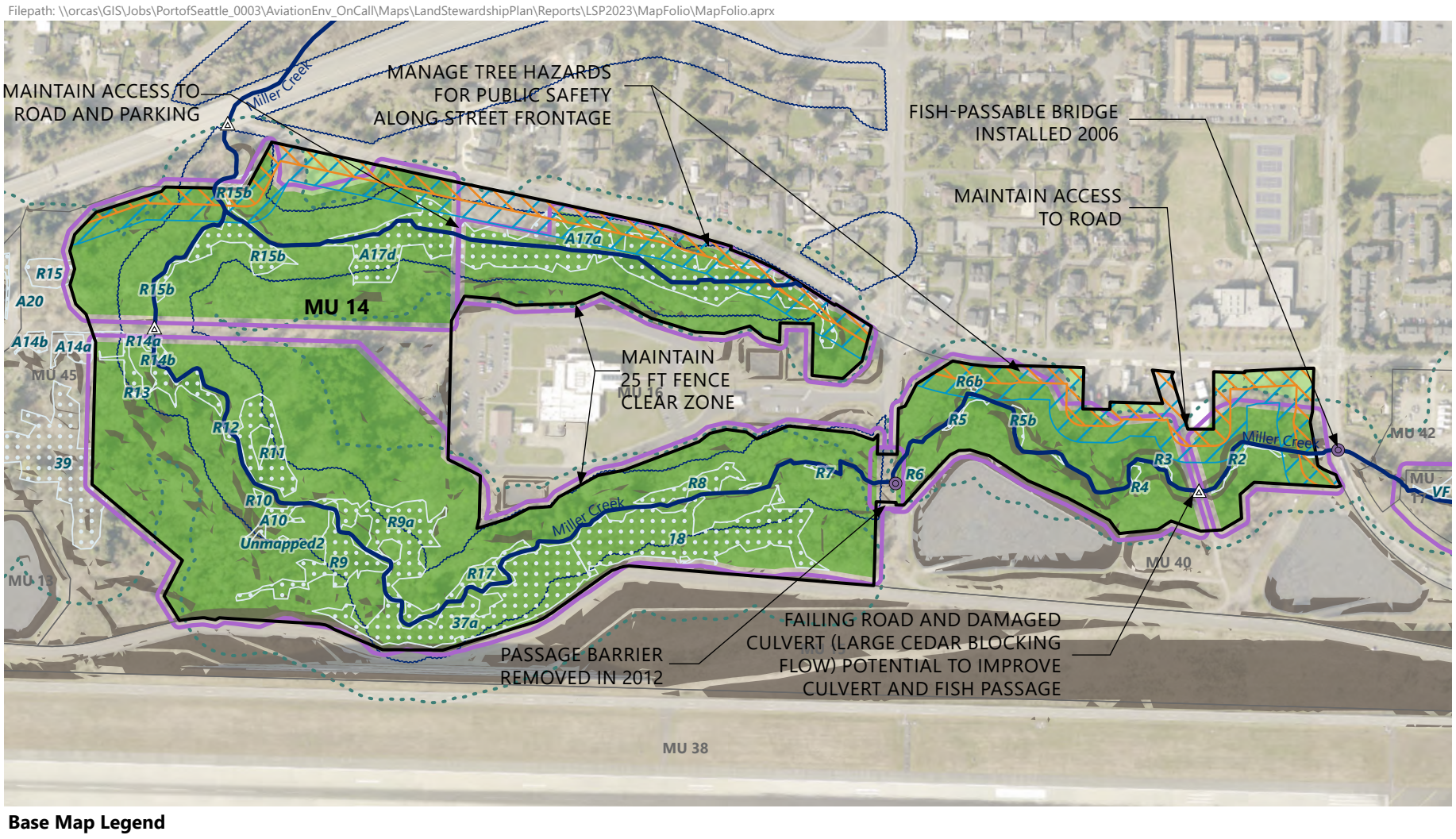


Base Map Legend

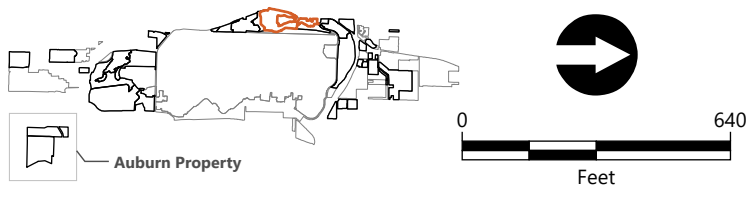
- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Stewardship Opportunity Area

- Enhance Degraded Habitat
- Protect Habitat

Culverts

- Fish Passable
- Unknown



Site Description

- The Miller Creek Mitigation Area covers most of the MU. The MU is consequently within a mitigation covenant and not available for development.
- There are areas along Des Moines Memorial Drive that are not within the covenant, including roads and bridges. These areas have less tree canopy cover and more invasive vegetation.
- A fish passage barrier was removed in 2012. Another fish passage culvert in this MU is damaged and a repair has the opportunity to improve habitat connectivitiy.
- The TRACON campus is not within the MU.
- This site's mitigation permit-required performance monitoring end in 2023. The Port will continue monitoring and maintaining the site to maintain invasive vegetation at maximum 10% cover and to protect high-value trees.
- A high-value tree survey was completed for this MU in 2023 identifying high-value trees and presence/absence of invasive species.

FLAT Assessment: Landscape Management Strategy

MU 14 is identified as a mitigation site and therefore did not undergo a FLAT assessment.

Site Acreage

61.4 Acres

Land Cover Analysis

0%	Buildings
1.3%	Impervious
0.3%	Dry Grass/Bare
77.7%	Forest
2.3%	Grass
18.3%	Shrub
0%	Water

Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F)

Equity Score: Very Low

Management Unit 17

Vacca Farm/Lora Lake Mitigation

LSP Action

Ecological Use: Existing Mitigation

Recommended Site-Based Management Actions

Maintain Existing Mitigation Sites (long term)

- Remove invasive vegetation
- Improve mitigation area performance through focused planting efforts
- Monitor forest and provide maintenance as needed

Manage and Prevent Hazards

- Remove ivy from trees to prevent hazards where adjacent to street frontage and public trail

Habitat Corridor

- Improve habitat within Miller Creek habitat corridor

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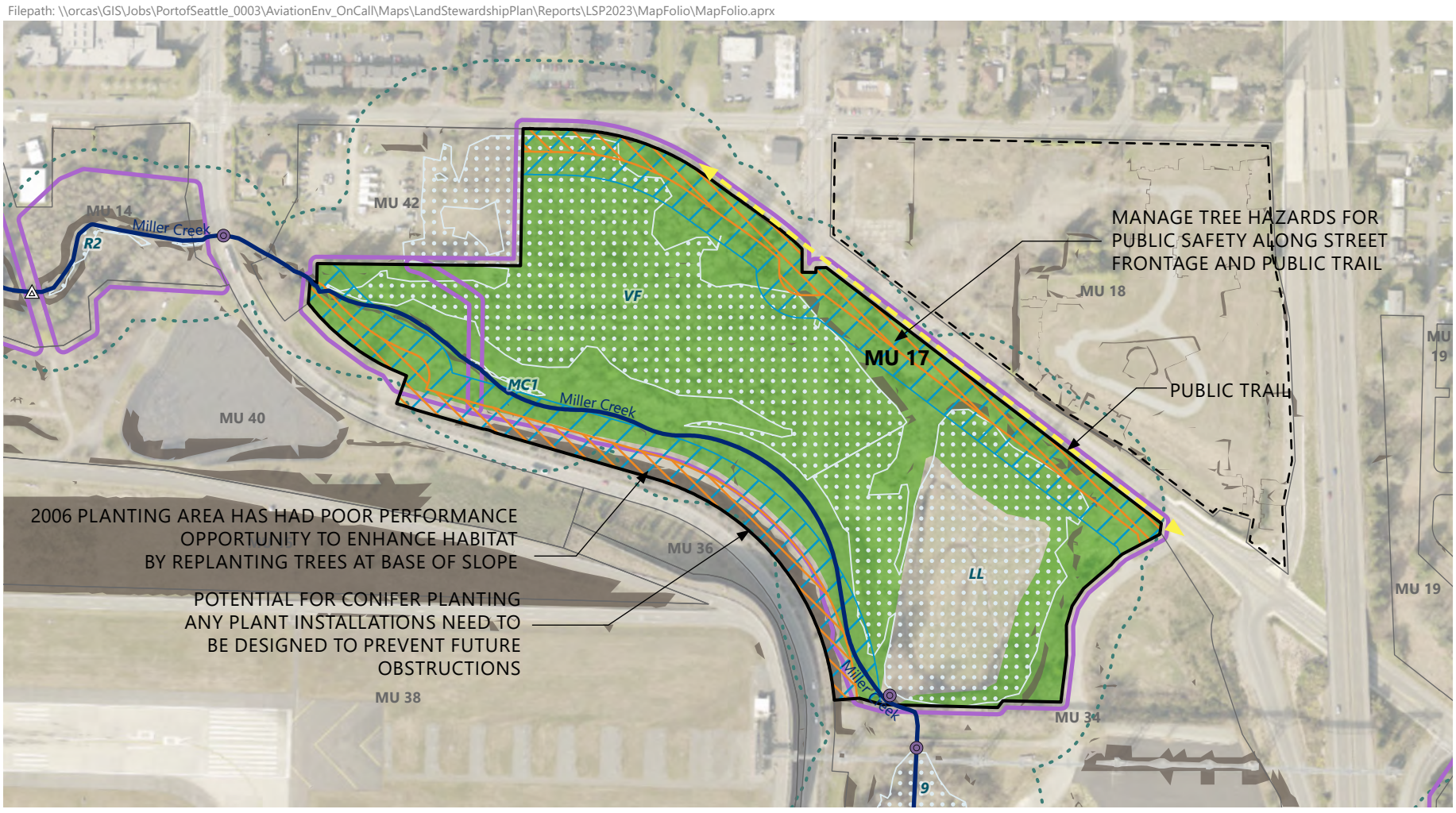


Base Map Legend

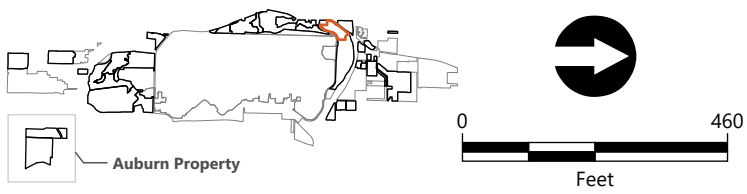
- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Wetland Buffer

Stewardship Opportunity Area

- Enhance Degraded Habitat
- Protect Habitat

Culverts

- Fish Passable
- Unknown



Site Description

- The Miller Creek/Vacca Farm/Lora Lake Mitigation Area (Wetland A1) covers most of this MU. The MU is consequently within a mitigation covenant and not available for development.
- There is an access road and fence along the eastern edge of the mitigation area. The access road runs along a berm with limited vegetation.
- MU 17 has opportunities for vegetation enhancement along the east edge.
- There is a is public trail that follows South 156th Street and another on Des Moines Memorial Drive (outside of Port Property). The vegetation cover along the public trails and roadway is limited with few trees. Dead trees are present.
- This site's mitigation permit-required performance monitoring end in 2023. The Port will continue monitoring and maintaining the site to maintain invasive vegetation at maximum 10% cover and to protect high-value trees.
- A high-value tree survey was completed for this MU in 2023 identifying high-value trees and presence/absence of invasive species.

FLAT Assessment: Landscape Management Strategy

MU 17 is identified as a mitigation site and therefore did not undergo a FLAT assessment.

Site Acreage

23.7 Acres

Land Cover Analysis

0%	Buildings
2.2%	Impervious
1.6%	Dry Grass/Bare
49%	Forest
6.4%	Grass
31.6%	Shrub
9.2%	Water

Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Very Low

Management Unit 18

NERA 1

LSP Action

Public Safety and Maintenance

Recommended Site-Based Management Actions

Manage and Prevent Hazards

- Prevent obstructions from establishing
- Prevent hazards, including treefall, along ROWs

Protect Infrastructure

- Remove invasive vegetation
- Minimally replant with hydroseed

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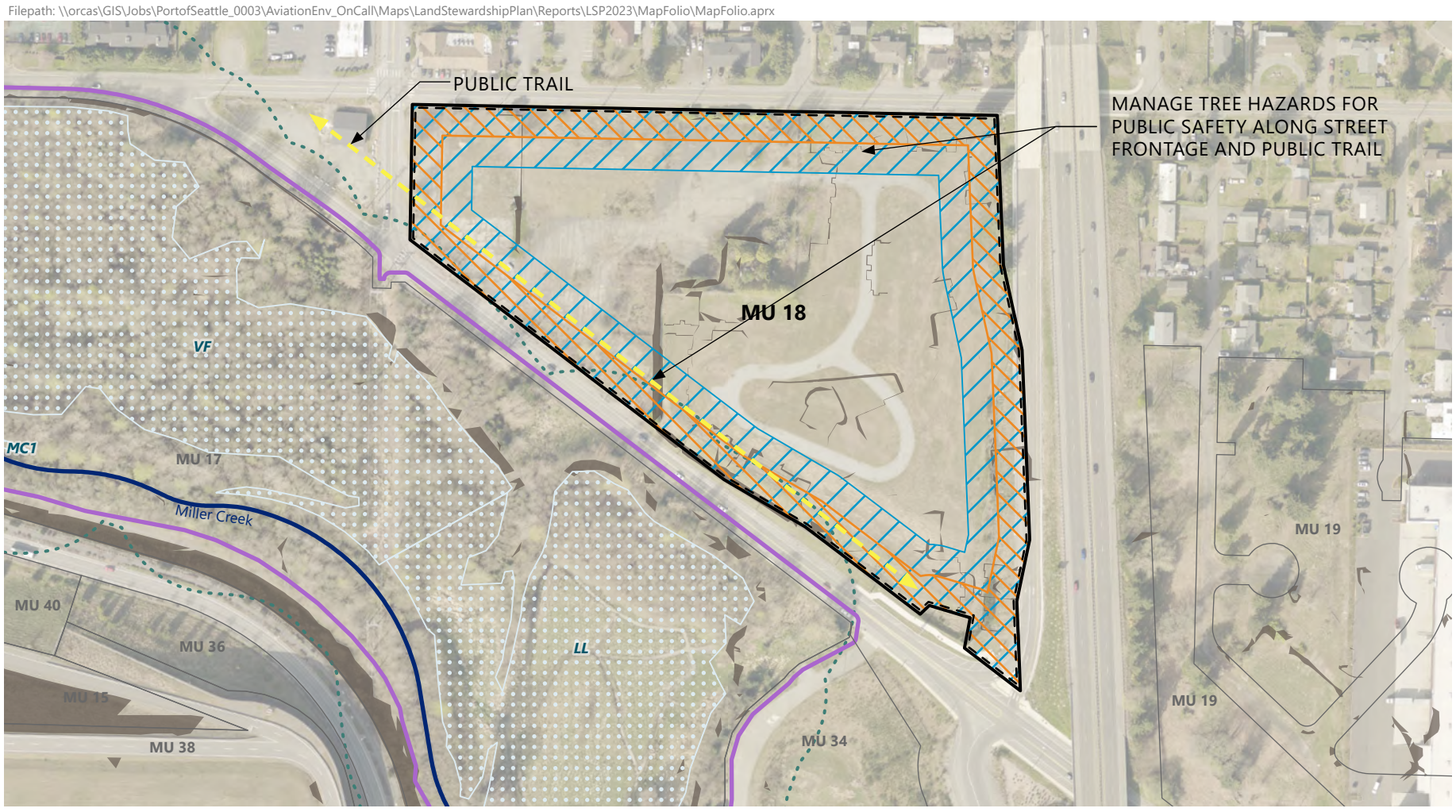
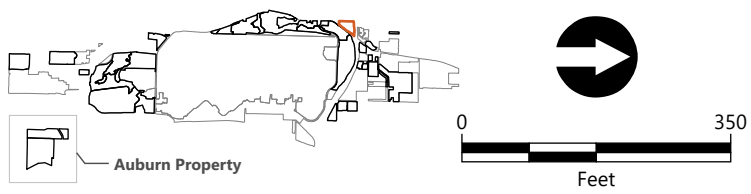


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Wetland Buffer



Site Description

- Airport Properties identify MU 18 as NERA 1, and the MU is a remediation site with special soil disturbance stipulations.
- The MU was formerly developed and has remnant roadway, infrastructure, and foundations.
- Invasive Himalayan blackberry is present on much of the open grass within the MU.

FLAT Assessment: Landscape Management Strategy

MU 18 is identified as public safety and maintenance and therefore did not undergo a FLAT assessment.

Site Acreage

13.2 Acres

Land Cover Analysis

0%	Buildings
7%	Impervious
71.7%	Dry Grass/Bare
6.2%	Forest
8.4%	Grass
6.8%	Shrub
0%	Water

Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F)

Equity Score: Very Low

Management Unit 20

Miller Creek at South 140th Street

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Enhance Habitat
- Remove invasive vegetation
- Install forest and understory planting communities
- Improve wetland complexity

Protect Infrastructure
- Prevent hazards, including treefall, along ROWs, along neighboring houses, and adjacent to cemetery
- Prevent establishment of future obstructions

Habitat Corridor
- Improve habitat within Miller Creek habitat corridor

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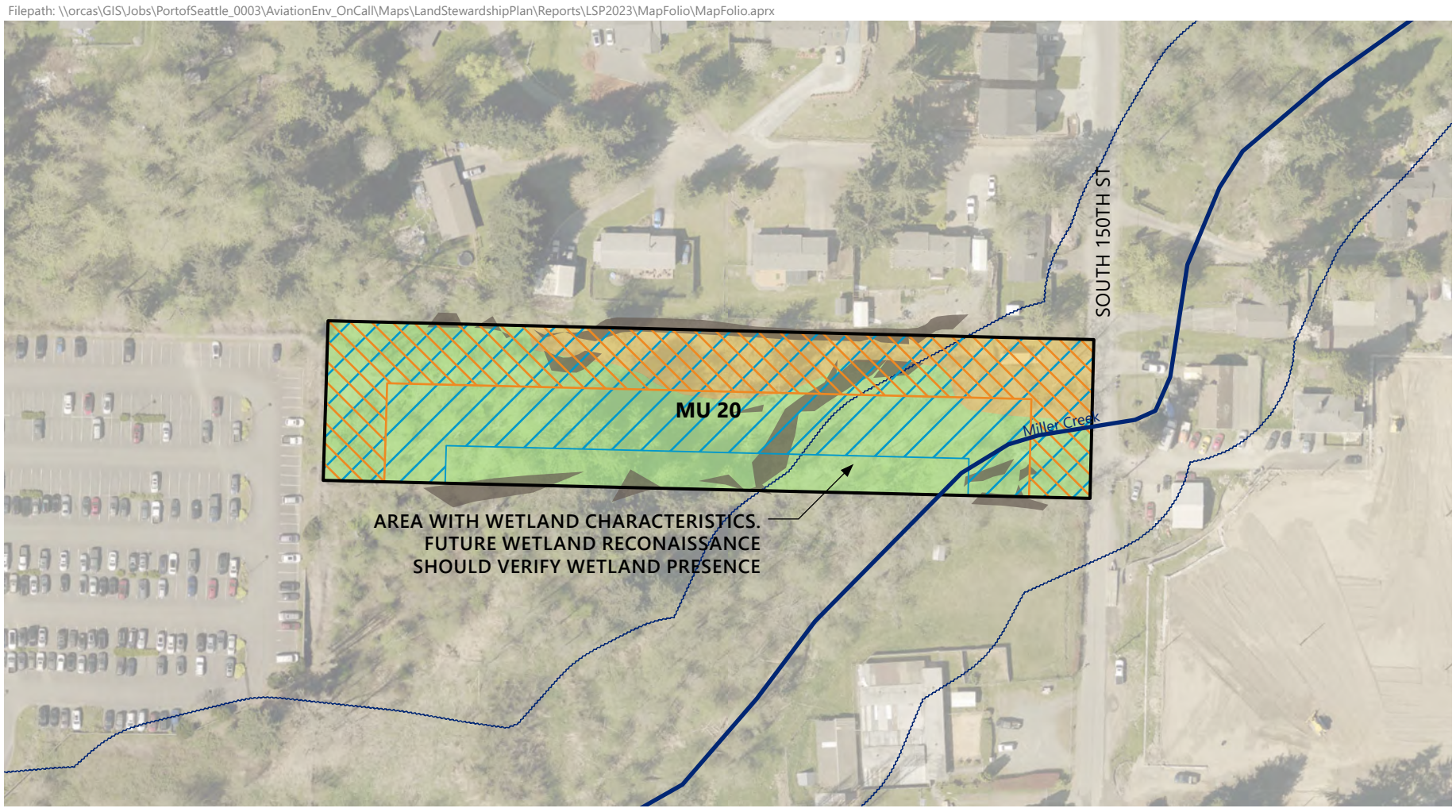


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Slope > 40%
- Stream
- Stream Buffer

Stewardship Opportunity Area
- Enhance Degraded Habitat
- Manage Invasive Species

Site Description

- MU 20 is located northwest of SEA. It is adjacent to residential properties on the west edge and a pet boarding facility on the east edge of the site.
- The main channel of Miller Creek flows through the northeast corner of MU 20 and its open channel continues southeast of the site.
- There is an area with wetland characteristics located within the Miller Creek stream buffer as indicated on the site plan map.
- Much of this MU is forested with mature native deciduous species including red alder, black cottonwood, bigleaf maples, willows, and sumac. A stand of conifers dominates the center of the site.
- Nonnative tree and shrub species are also present in smaller quantities, including cherry laurel, cherries, and holly.
- The majority of the understory is comprised of invasive species, primarily Himilayan blackberry, making the site difficult to access.
- Dozens of snags, dead trees, and fallen branches are present through the interior of the site.

Site Acreage

1.9 Acres

Land Cover Analysis

0%	Buildings
0.2%	Impervious
0%	Dry Grass/Bare
82.3%	Forest
3.3%	Grass
14.2%	Shrub
0%	Water

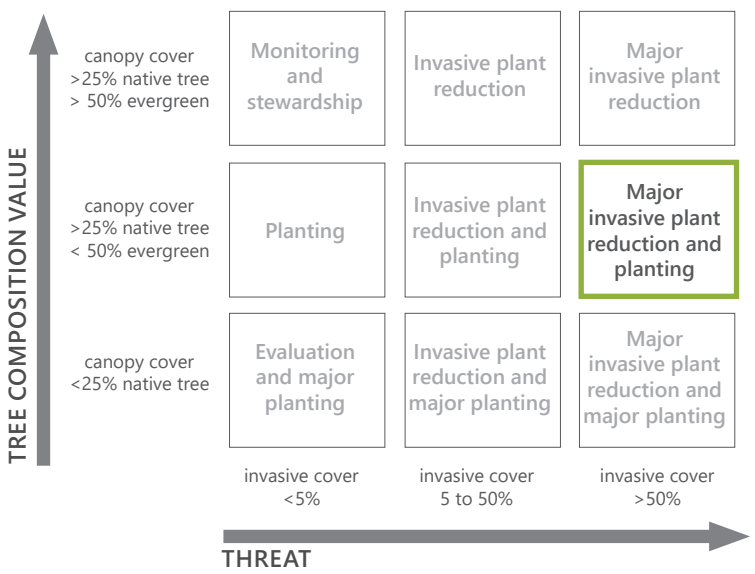
Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F)

Equity Score: Low

FLAT Assessment: Landscape Management Strategy

Adapted from Green Seattle Partnership (Ciecko et al. 2016)



Management Unit 22

Des Moines Nursery/Williams Mitigation

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Enhance/Expand Habitat
- Install forest and understory planting communities
- Remove invasive vegetation
- Monitor forest and provide maintenance as needed

Connect Habitat
- Connect habitat to adjacent habitat corridors
- Restore stream channel

Community Benefits
- Maintain community access along public trail
- Plant along visual corridors

Habitat Corridor
- Improve habitat within Miller Creek habitat corridor

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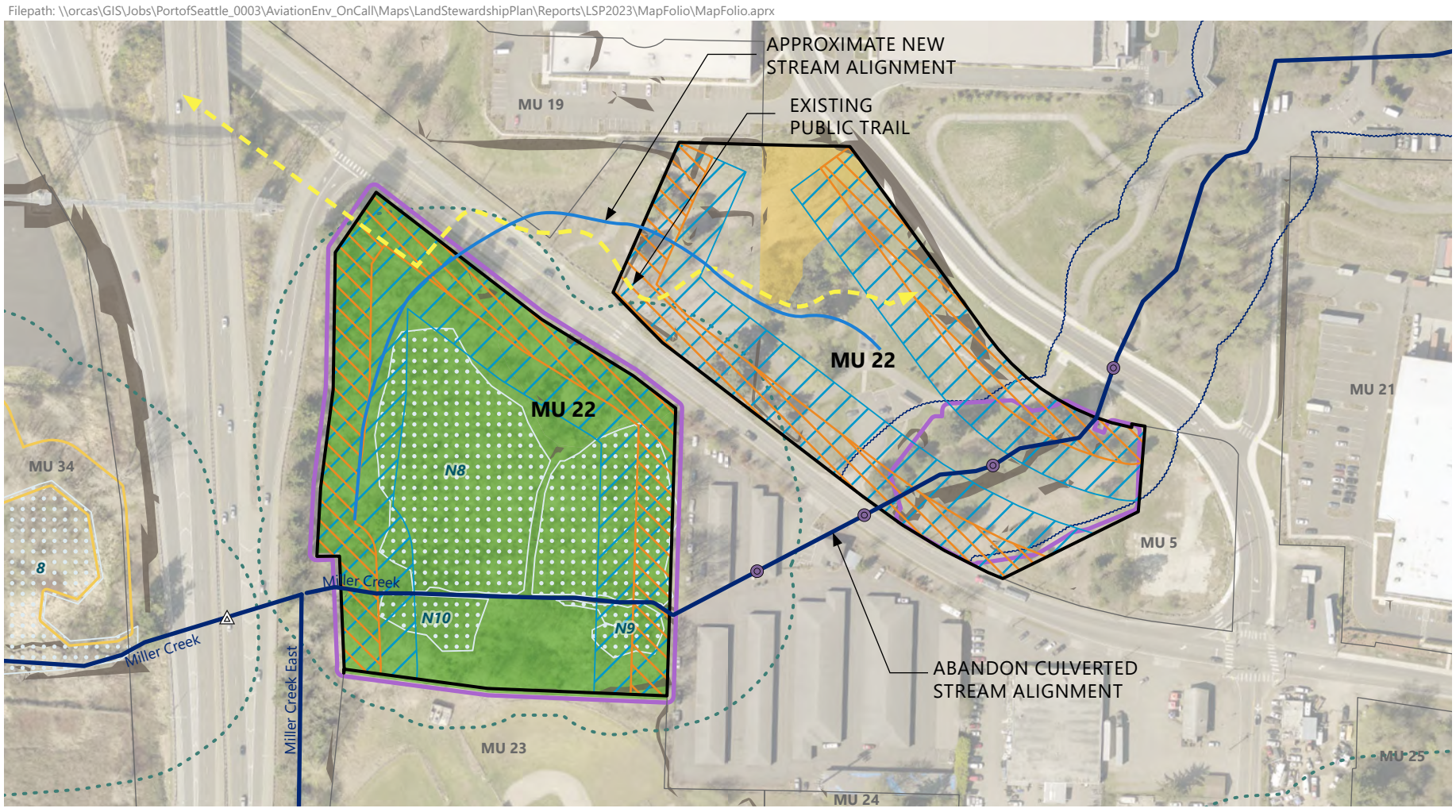


Site Description

- The Des Moines Nursery Mitigation Area (Wetland N8) covers much of this MU. The MU is consequently within a mitigation covenant and not available for development.
- The MU is entirely forested with exception of a portion along its western edge and along Des Moines Memorial Drive South, where there is an open area dominated by invasive Himalayan blackberry and Scot's broom.
- A tributary of Miller Creek flows through MU 22 in culverts. The culverted portion of the stream has been abandoned and a new channel has been established in a recent stream restoration project.

Site Acreage

10.7 Acres

Land Cover Analysis

0%	Buildings
4.3%	Impervious
1.6%	Dry Grass/Bare
31.3%	Forest
20.8%	Grass
42.1%	Shrub
0%	Water

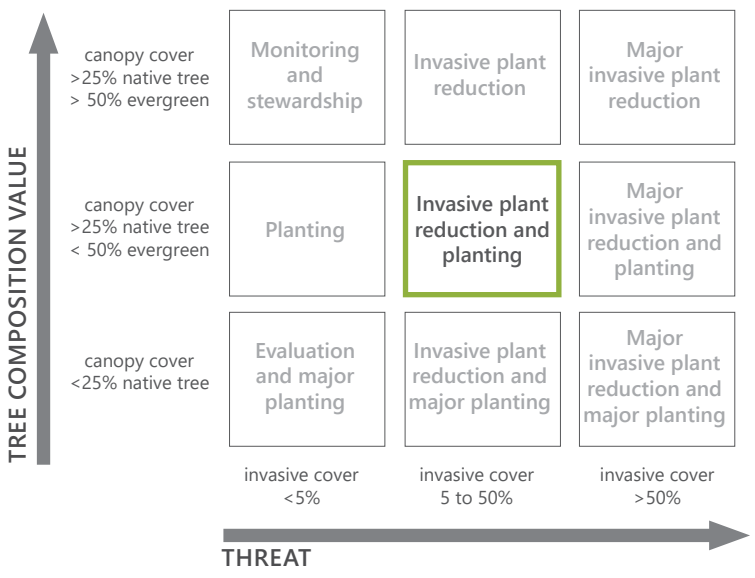
Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F)

Equity Score: Very Low

FLAT Assessment: Landscape Management Strategy

Adapted from Green Seattle Partnership (Ciecko et al. 2016)



Management Unit 24

Miller Creek East

LSP Action

Ecological Use: Potential Mitigation

Recommended Site-Based Management Actions

Identify Mitigation Opportunities
- Establish advanced mitigation sites

Manage and Prevent Hazards
- Prevent hazards, including treefall, along ROWs

Habitat Corridor
- Improve habitat within Miller Creek habitat corridor

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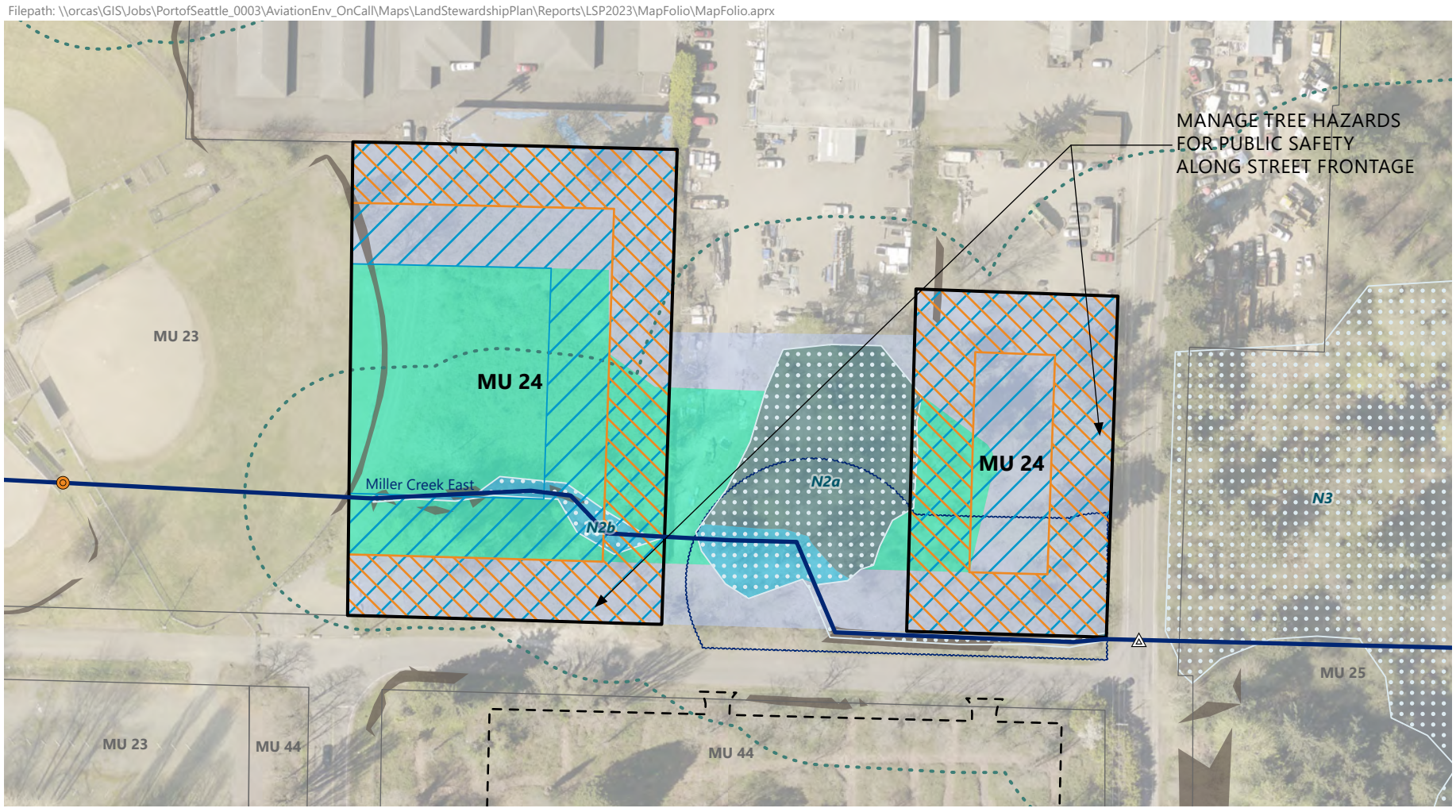
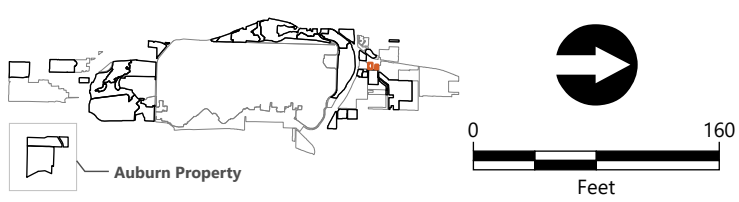


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Stewardship Opportunity Area
- Enhance Wetland Buffer
- Enhance Wetland
- Preserve Wetland
- Re-Establish Wetland

Culverts
- Full Fish Barrier
- Unknown



Site Description

- MU 24 is in the city of SeaTac and consists of two Port-owned parcels, a portions of which are proposed for mitigation. Mitigation would require property acquisition.
- Miller Creek flows through MU 24 until it enters a wetland on site.
- Wetlands N2a and Wetland N2b are located in the MU.
- Invasive species exist in the wetland buffers.

FLAT Assessment: Landscape Management Strategy

MU 24 is addressed in further detail in the *Mitigation Site Opportunity Assessment* and therefore did not receive a FLAT assessment.

Site Acreage

3.4 Acres

Land Cover Analysis

0.1%	Buildings
1.2%	Impervious
1.6%	Dry Grass/Bare
50.2%	Forest
17.4%	Grass
29.6%	Shrub
0%	Water

Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Very Low

Management Unit 26

Wetland 2

LSP Action

Ecological Use: Potential Mitigation

Recommended Site-Based Management Actions

Identify Mitigation Opportunities
- Establish advanced mitigation sites

Enhance Habitat
- Remove invasive vegetation
- Install forest and understory planting

Community Benefits
- Maintain community planting area
- Plant along visual corridors

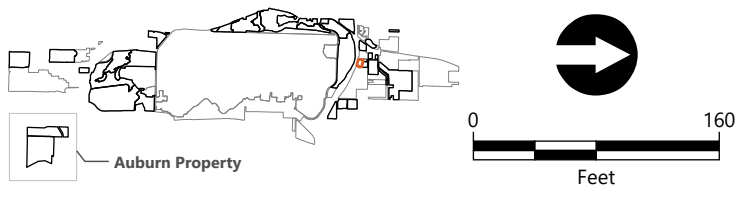
Habitat Corridor
- Improve habitat within Miller Creek habitat corridor

Filepath: \\orcas\GIS\Jobs\PortofSeattle_0003\AviationEnv_OnCall\Maps\LandStewardshipPlan\Reports\LSP2023\MapFolio\MapFolio.aprx

Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Community Planting Area
- Public Hazard Area
- Slope > 40%
- Wetland
- Wetland Buffer

Stewardship Opportunity Area
- Enhance Degraded Habitat
- Enhance Wetland Buffer
- Enhance Wetland
- Preserve Wetland



Site Description

- MU 26 is primarily zoned as Aviation Operations.
- Wetlands 1 and 2 are within the site and have limited native vegetation.
- Invasive species in the wetlands include Himalayan blackberry.
- Miller Creek East and a gravel maintenance road for the runway lift safety tower run adjacent to the MU.
- A community planting event occurred on this MU.

FLAT Assessment: Landscape Management Strategy

MU 26 is addressed in further detail in the *Mitigation Site Opportunity Assessment* and therefore did not receive a FLAT assessment.

Site Acreage

3.5 Acres

Land Cover Analysis

0%	Buildings
0%	Impervious
0.2%	Dry Grass/Bare
65%	Forest
7.6%	Grass
27.2%	Shrub
0%	Water

Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Very Low

Management Unit 33

L-Shape Parcel

LSP Action

Public Safety and Maintenance

Recommended Site-Based Management Actions

Manage and Prevent Hazards

- Prevent future obstructions

Protect Infrastructure

- Manage invasive vegetation
- Minimally replant with hydroseed

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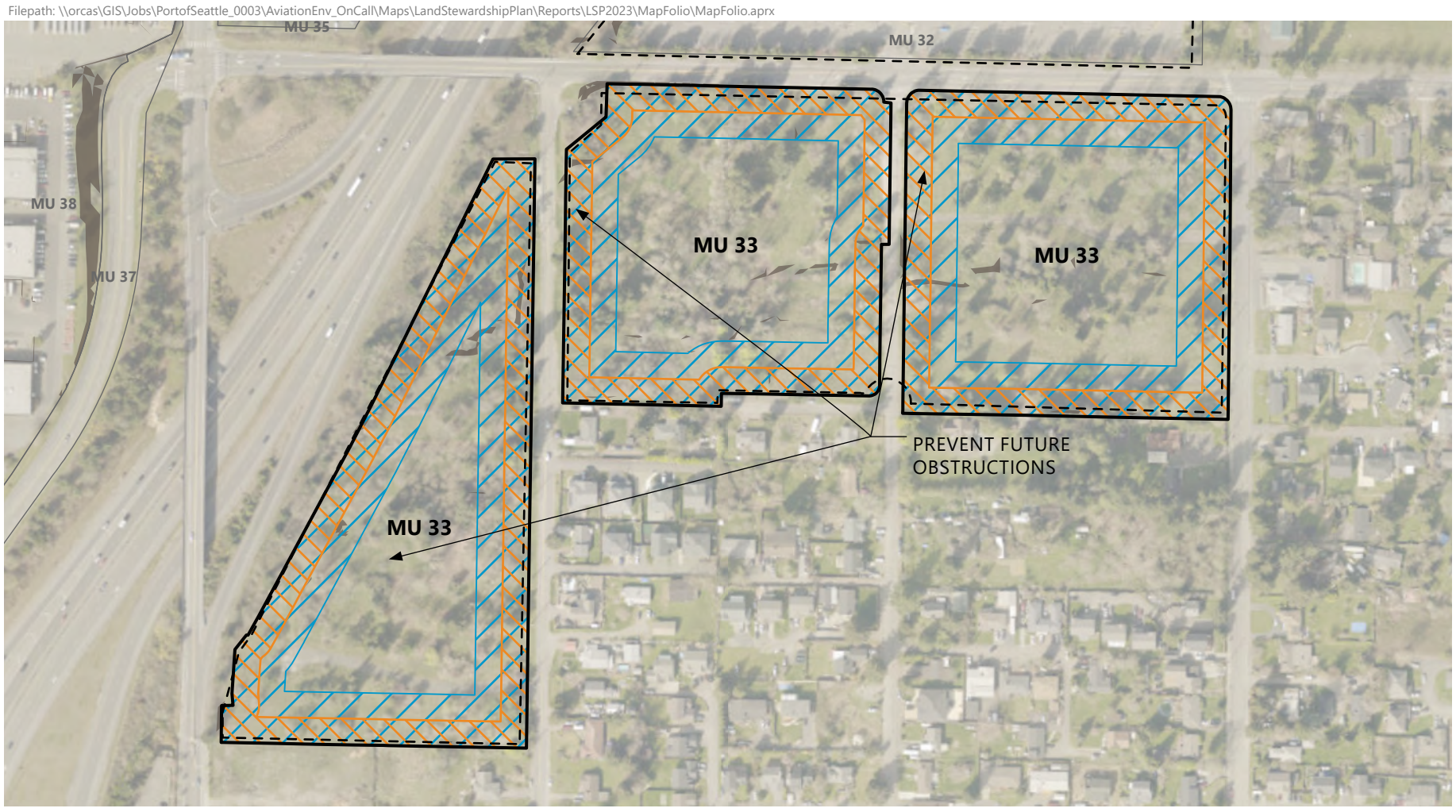
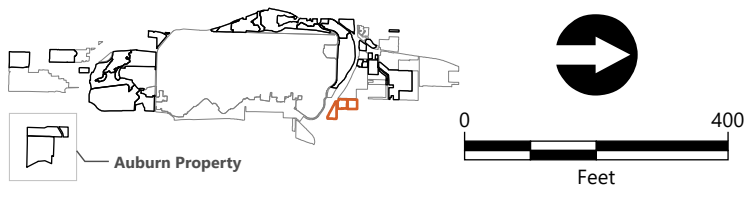


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Public Hazard Area
- Slope > 40%



Site Description

- Airport Properties identify MU 33 as the L-Shape Parcel, and it is currently available for development.
- MU 33 contains a mix of forest, shrub, and grass land cover. Invasive species including Himalayan blackberry and Scot's broom are found throughout the site, but are partially managed through mowing.

FLAT Assessment: Landscape Management Strategy

MU 33 is identified as public safety and maintenance and therefore did not undergo a FLAT assessment.

Site Acreage

26.2 Acres

Land Cover Analysis

0%	Buildings
3.2%	Impervious
3%	Dry Grass/Bare
46.8%	Forest
35.4%	Grass
11.5%	Shrub
0%	Water

Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F)

Equity Score: Very Low

Management Unit 34

North of 156th

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Enhance/Expand Habitat
- Remove invasive vegetation
- Install forest and understory planting communities
- Actively maintain non-stream and stream culverts. Remove culvert and daylight fish-passable channels.

Connect Habitat
- Connect habitat to adjacent habitat corridors
- Increase understory planting along roadways

Maintain Existing Mitigation Sites (long term)
- Manage FCSP enhanced sites

Communbity Benefits
- Plant along visual corridors

Habitat Corridor
- Improve habitat within Miller Creek habitat corridor

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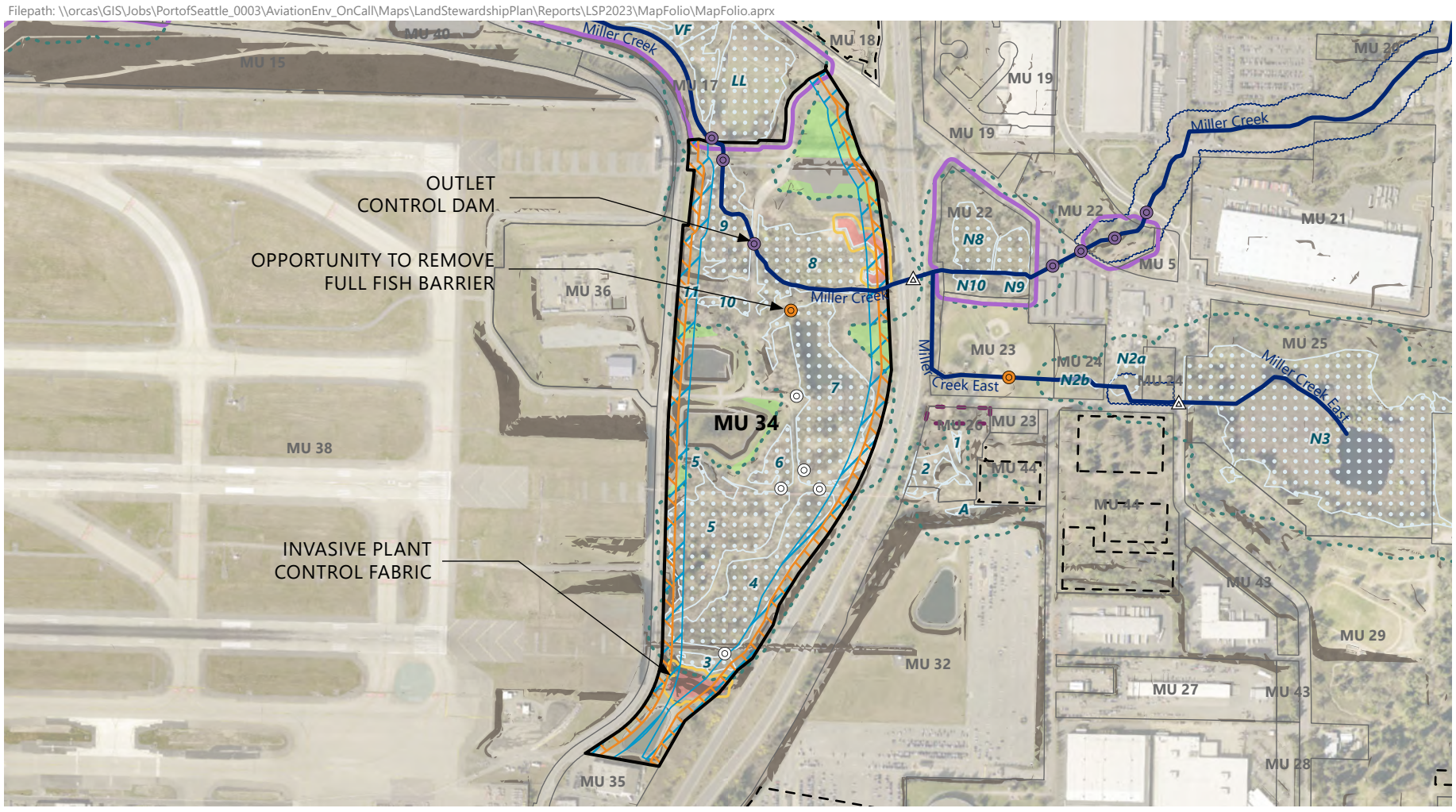
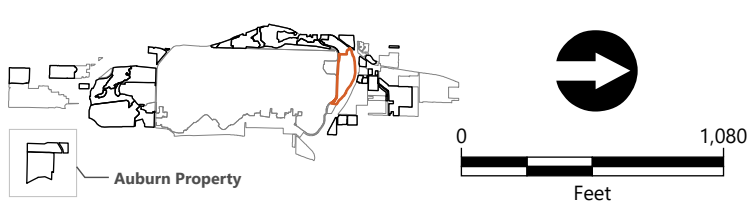


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- FCSP Mitigation Site
- Community Planting Area
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Stewardship Opportunity Area
- Enhance Degraded Habitat
- Conduct Long-Term Mitigation Action

Culverts
- Fish Passable
- Full Fish Barrier
- N/A
- Unknown

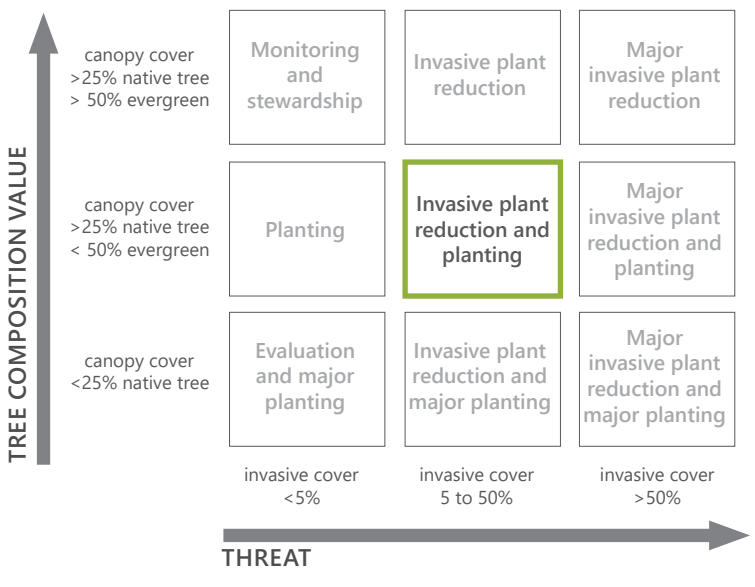


Site Description

- MU 34 is immediately north of the AOA and the third runway embankment.
- Miller Creek runs through the western portion of MU 34, and most of the MU is covered with wetlands (Wetlands 3, 4, 5, 6, 7, 8, 9, and 10) and their associated buffers. Much of the area outside of wetlands and wetland buffers is utilized as stormwater infiltration ponds.
- There are areas within the wetland buffers and adjacent to stormwater infiltration ponds that are dominated by invasive species, such as Himalayan blackberry and Scot's broom.
- Invasive species are present along roadways.
- An FCSP mitigation planting area (Site P-1) is within the Wetland 8 buffer.
- MU managed as King County RDF.

FLAT Assessment: Landscape Management Strategy

Adapted from Green Seattle Partnership (Ciecko et al. 2016)



Site Acreage

64.7 Acres

Land Cover Analysis

0.5%	Buildings
10.2%	Impervious
3.8%	Dry Grass/Bare
38.7%	Forest
12.6%	Grass
25.9%	Shrub
8.3%	Water

Morning Heat Index Results:

High Heat Index (average exceeds 62.6 degrees F)

Equity Score: Very Low

Management Unit 39

Tyee and DMC Regional Detention Facility

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Enhance/Expand Habitat
- Remove invasive vegetation
- Increase forest cover through planting; when forest cover is not feasible, increase shrub cover
- Improve forest structural complexity

Connect Habitat
- Connect habitat to adjacent corridors

Protect Infrastructure
- Protect operational areas
- Remove obstructions
- Prevent future obstructions
- Maintain FCSP plantings

Habitat Corridor
- Improve habitat within Des Moines Creek habitat corridor

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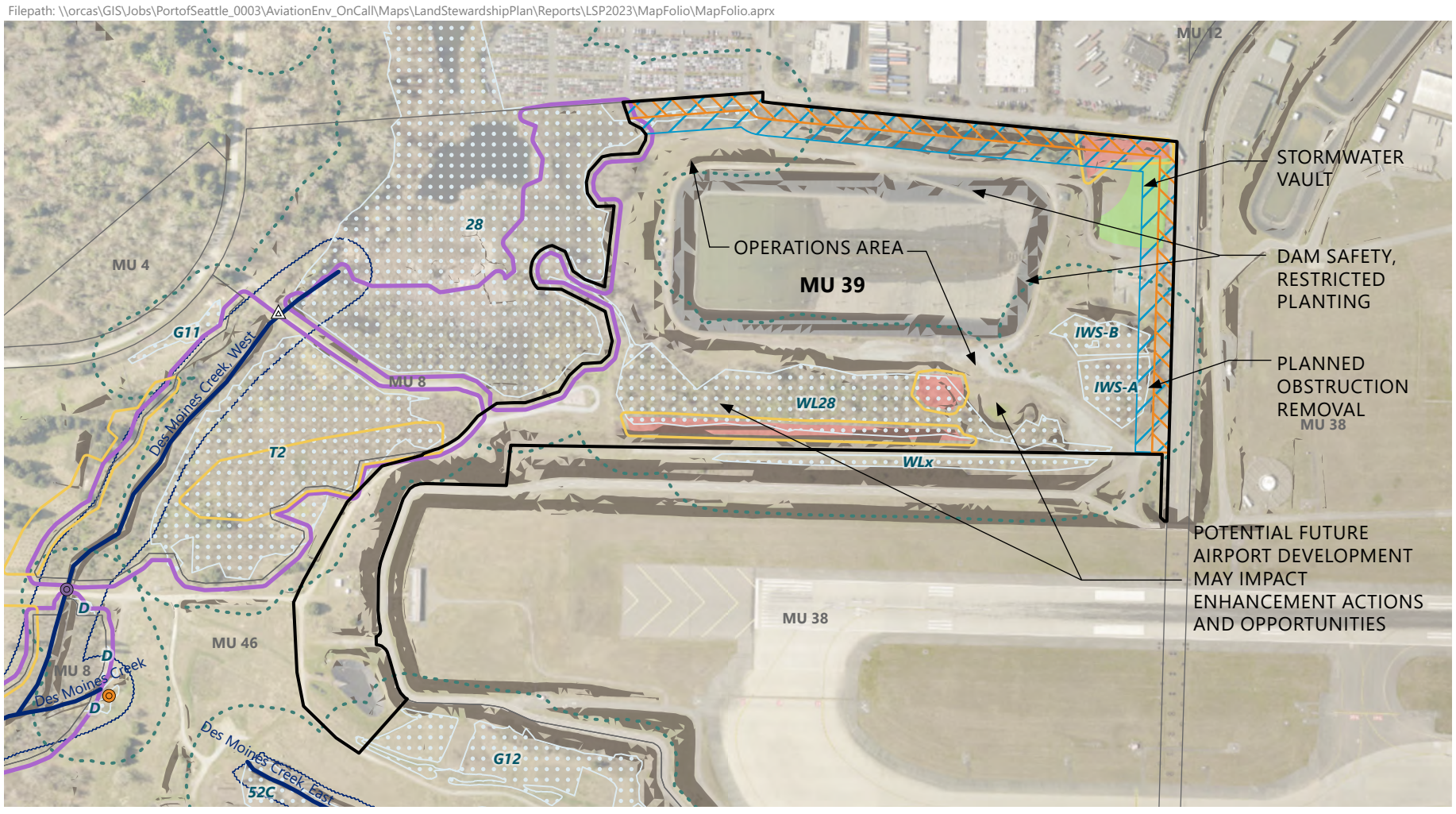
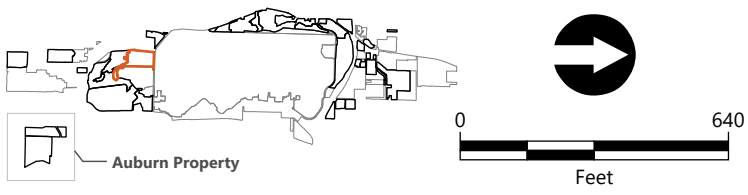


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- FCSP Mitigation Site
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Stewardship Opportunity Area
- Enhance Degraded Habitat
- Conduct Long-Term Mitigation Action

Culverts
- Fish Passable
- Full Fish Barrier
- Unknown

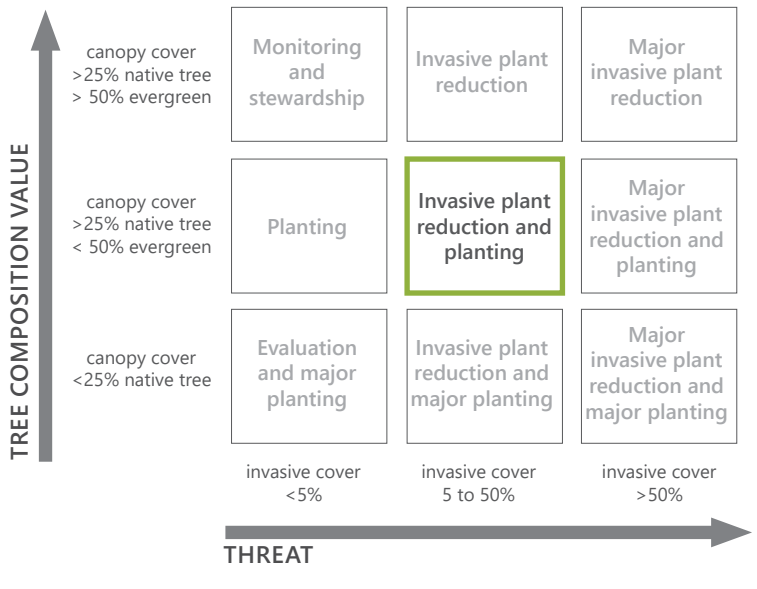


Site Description

- MU 39 includes IWS Lagoon 3, a large stormwater pond. Wetland 28 surrounds much of the pond, adjacent to a tributary of Des Moines Creek. The north end is slated for operational support infrastructure.
- An FCSP mitigation planting area is located along South 188th Street, on the northwestern corner of the MU and east of the pond near the AOA boundary.
- MU 39 is subject to vegetation height restrictions within the RSA and RPZ.
- Much of the land cover adjacent to the pond is grass, with some limited shrub and forest land cover. Invasive vegetation including Himalayan blackberry and Scot's broom is prevalent.
- No planting can occur near the lagoon due to dam safety requirements.

FLAT Assessment: Landscape Management Strategy

Adapted from Green Seattle Partnership (Ciecko et al. 2016)



Site Acreage

46.3 Acres

Land Cover Analysis

0.2%	Buildings
11.6%	Impervious
3.1%	Dry Grass/Bare
23.7%	Forest
21.7%	Grass
12.9%	Shrub
26.8%	Water

Morning Heat Index Results:

High Heat Index (average exceeds 62.6 degrees F)

Equity Score: Very Low

Management Unit 40

West of Airport

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Enhance/Expand Habitat
- Remove invasive vegetation
- Increase forest cover through planting; when forest cover is not feasible, increase shrub cover

Connect Habitat
- Connect habitat to adjacent habitat corridors

Protect Infrastructure
- Repair culverts and maintain roads

Communbity Benefits
- Plant along visual corridors

Habitat Corridor
- Improve habitat within Miller Creek habitat corridor

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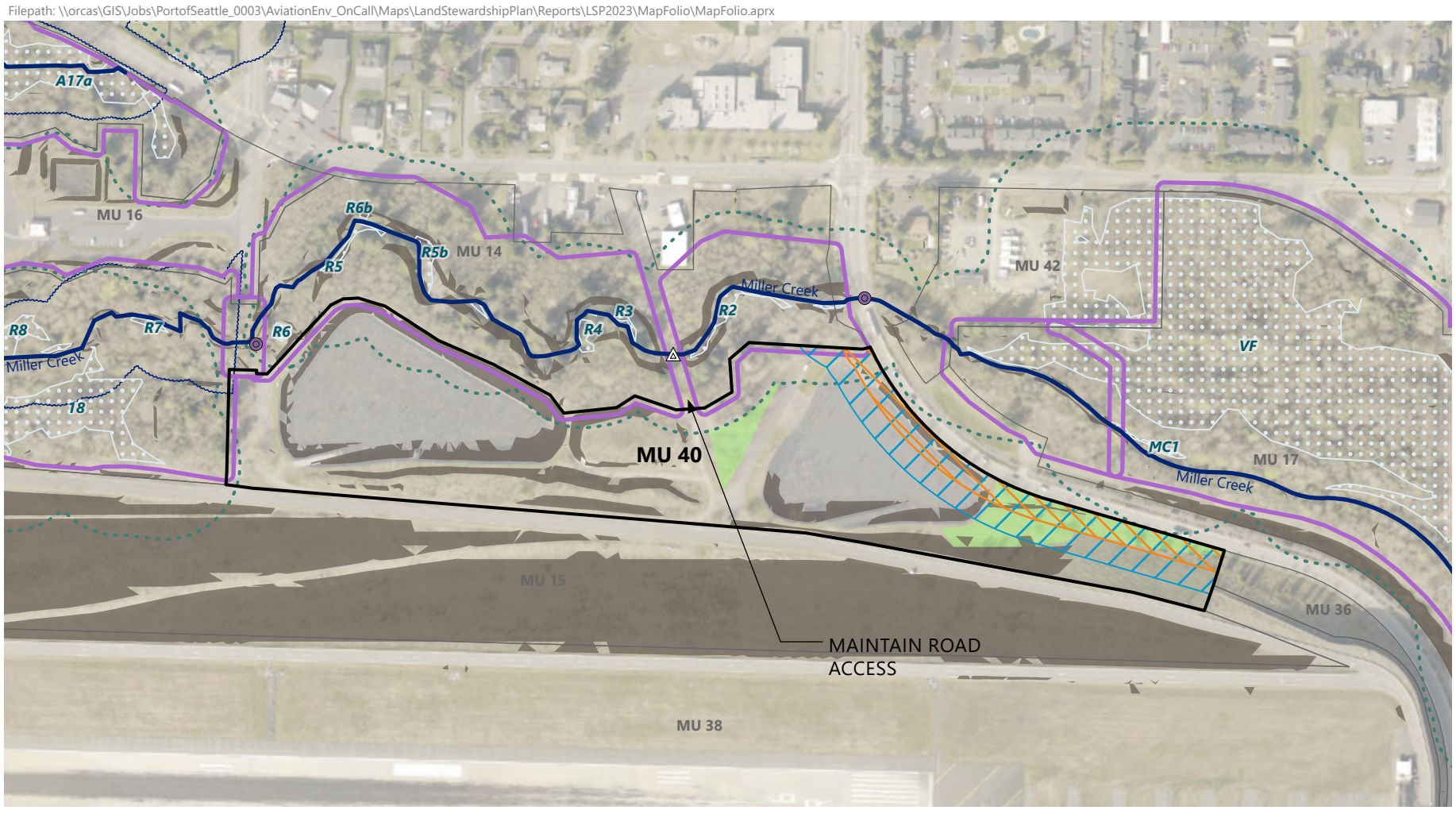


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Stewardship Opportunity Area
- Enhance Degraded Habitat

Culverts
- Fish Passable
- Unknown

Site Description

- MU 40 is at the base of the third runway embankment, and most of it is a stormwater pond. There are no plans for development in this MU.
- North of the pond and between the embankment and South 156th Way, there is a area dominated by grass and invasive vegetation including Scot's broom.
- The western edge of MU 40 is within the habitat corridor for Miller Creek.

Site Acreage

14.1 Acres

Land Cover Analysis

0%	Buildings
11%	Impervious
4.3%	Dry Grass/Bare
6.5%	Forest
25.3%	Grass
14%	Shrub
38.9%	Water

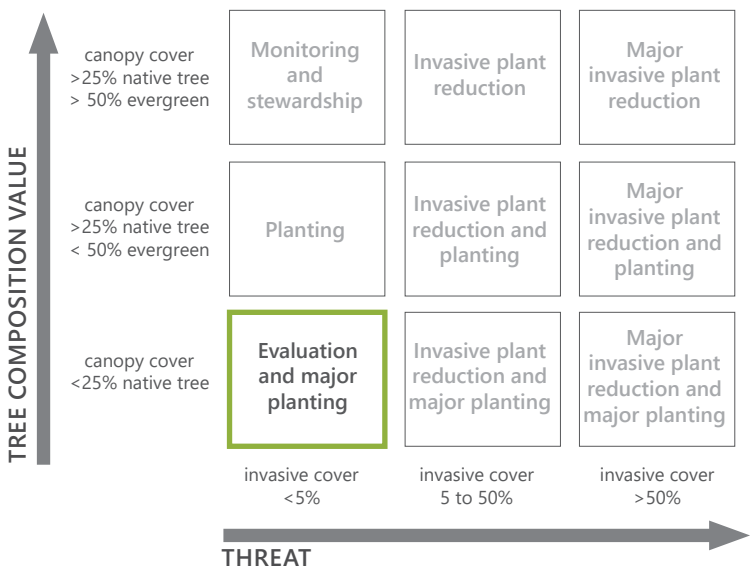
Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Very Low

FLAT Assessment: Landscape Management Strategy

Adapted from Green Seattle Partnership (Ciecko et al. 2016)



Management Unit 42

RST Property

LSP Action

Ecological Use: Potential Mitigation

Recommended Site-Based Management Actions

Identify Mitigation Opportunities

- Establish advanced mitigation sites

Habitat Corridor

- Improve habitat within Miller Creek habitat corridor

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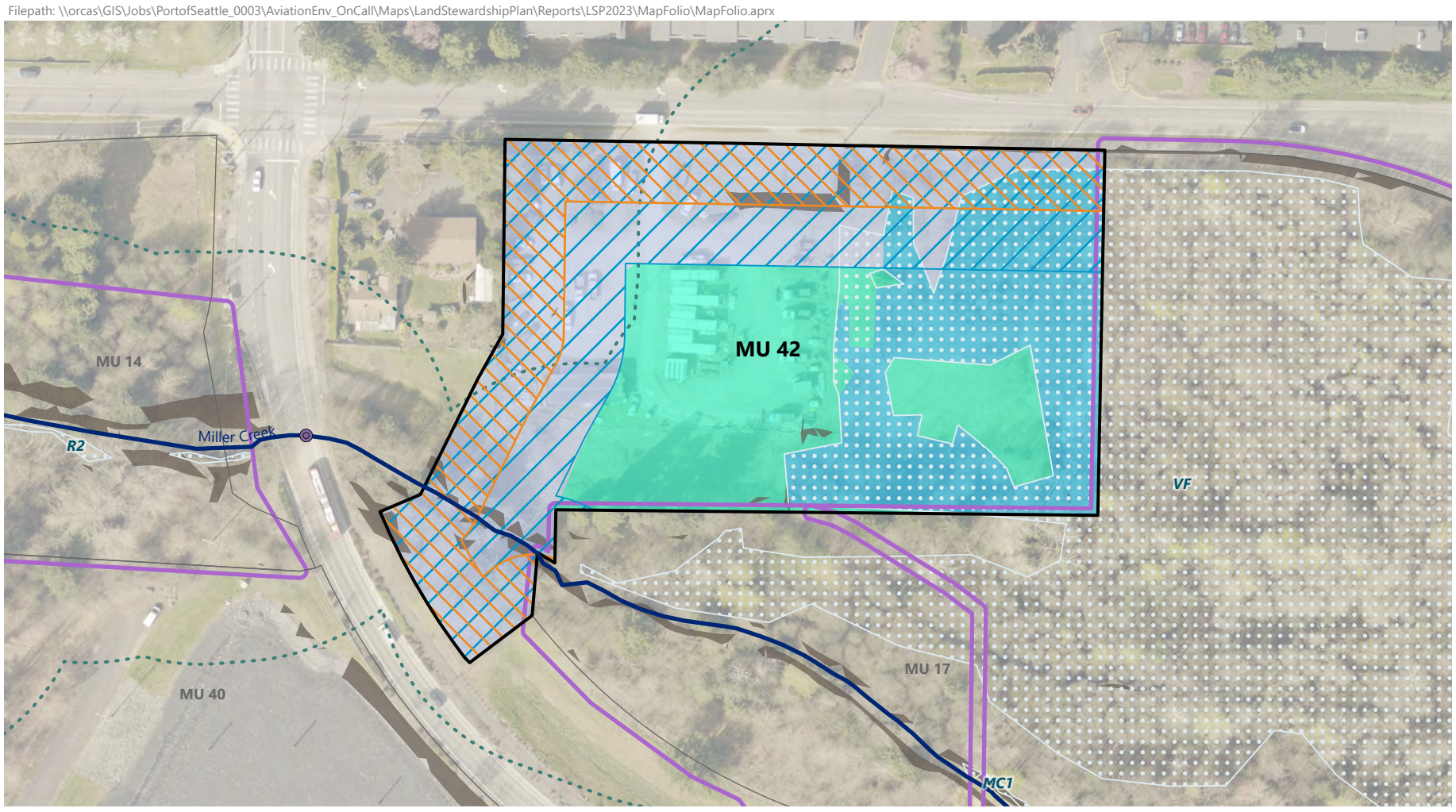


Base Map Legend

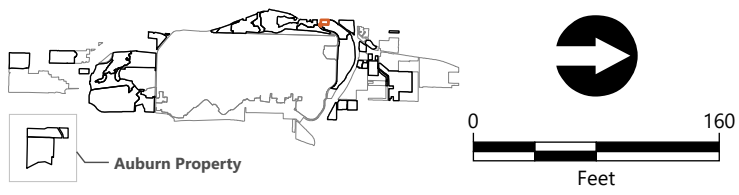
- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- Slope > 40%
- Stream
- Wetland
- Wetland Buffer

Stewardship Opportunity Area

- Enhance Wetland Buffer
- Enhance Wetland
- Re-Establish Wetland

Culverts

- Fish Passable



Site Description

- MU 42 is primarily zoned as Community Business, with a portion as Aviation Commercial.
- Miller Creek flows through the site.
- The Miller Creek Mitigation Area, which includes Wetland A1 with an associated restrictive covenant, is adjacent to and likely shares a surface water connection with the MU.
- A portion of the wetland and its buffer is heavily impacted by invasive species. The buffer is also impacted by development.

FLAT Assessment: Landscape Management Strategy

MU 42 is addressed in further detail in the *Mitigation Site Opportunity Assessment* and therefore did not receive a FLAT assessment.

Site Acreage

3.8 Acres

Land Cover Analysis

5.8%	Buildings
19.7%	Impervious
5.2%	Dry Grass/Bare
16.8%	Forest
33.2%	Grass
19.5%	Shrub
0%	Water

Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Very Low

Management Unit 43

Boeing Buffer

LSP Action

Ecological Use: Habitat Enhancement

Recommended Site-Based Management Actions

Enhance Habitat
- Remove invasive vegetation
- Install forest and understory planting communities
- Improve forest structural complexity

Protect Infrastructure
- Prevent hazards, including treefall, along ROWs

Communbity Benefits
- Plant along visual corridors

Habitat Corridor
- Improve habitat within Miller Creek habitat corridor

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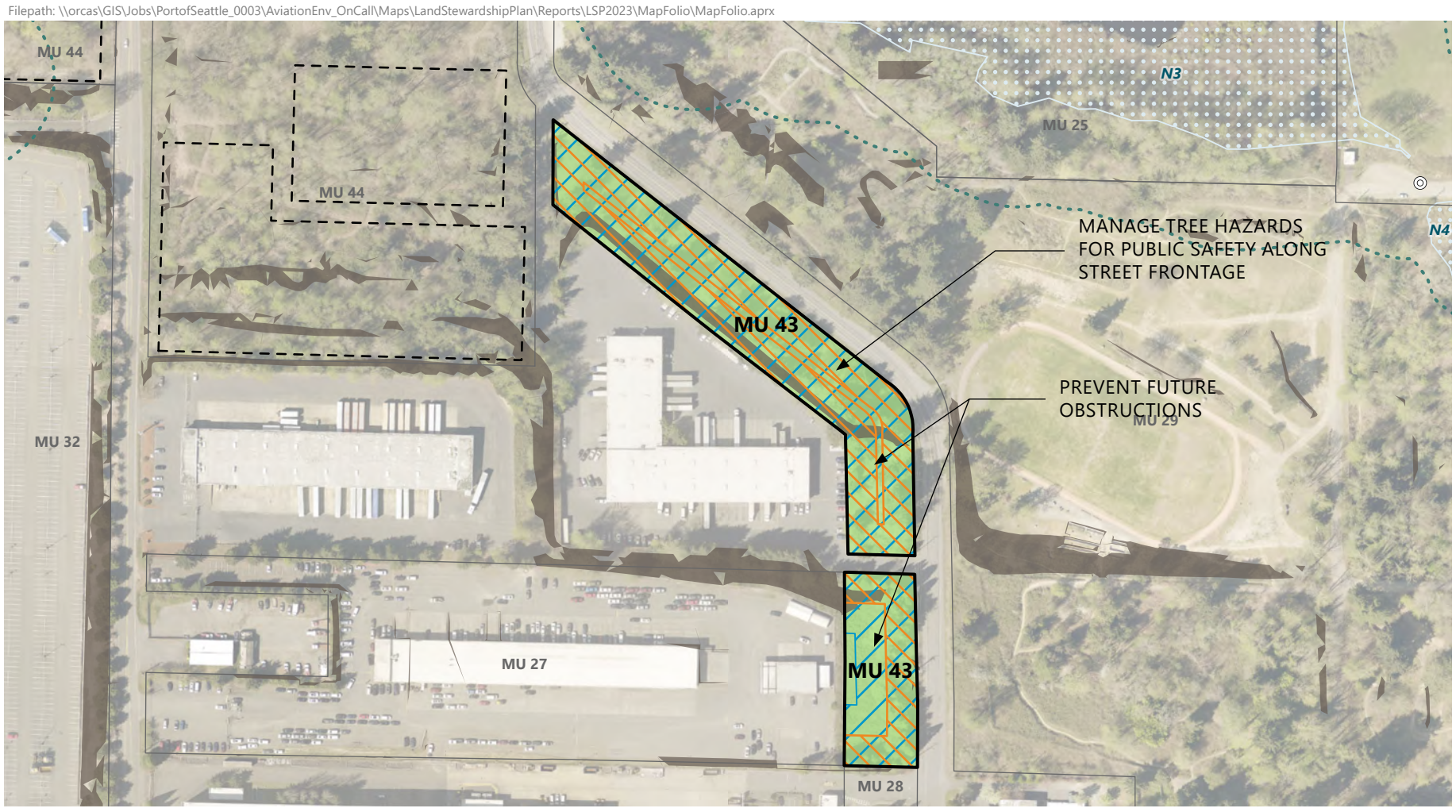


Site Description

- Airport Properties identify MU 43 as Port-owned property that is not leased and not available for development. The eastern section of MU 43 is adjacent to the Boeing Company lease area.
- The forest canopy is mixed with mature deciduous and coniferous trees, predominantly Douglas fir.
- Much of MU 43 understory, in particular the areas adjacent to South 142nd Street, are dominated by invasive Himalayan blackberry.
- Existing trees have not been currently identified for FCSP action, but this site should be monitored and managed for future obstructions. A maximum vegetation height analysis is needed to better understand planting potential.

Site Acreage

3.2 Acres

Land Cover Analysis

0%	Buildings
2.2%	Impervious
0.6%	Dry Grass/Bare
57.8%	Forest
7.4%	Grass
32%	Shrub
0%	Water

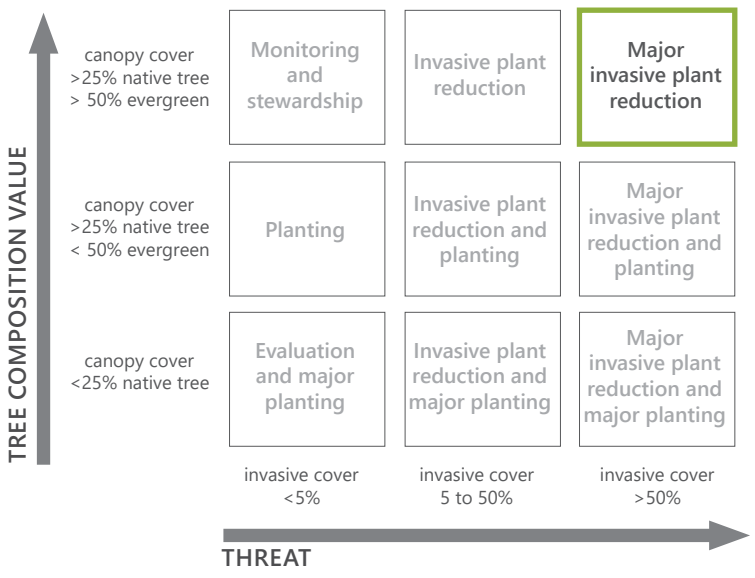
Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Low

FLAT Assessment: Landscape Management Strategy

Adapted from Green Seattle Partnership (Ciecko et al. 2016)



Management Unit 44

13-Acre Parcel

LSP Action

Public Safety and Maintenance

Recommended Site-Based Management Actions

Manage and Prevent Hazards
- Manage tree hazards
- Prevent future obstructions

Protect Infrastructure
- Remove invasive vegetation
- Minimally replant with hydroseed

Communbity Benefits
- This MU is adjacent to public open space and is highly visible. Plant along visual corridors

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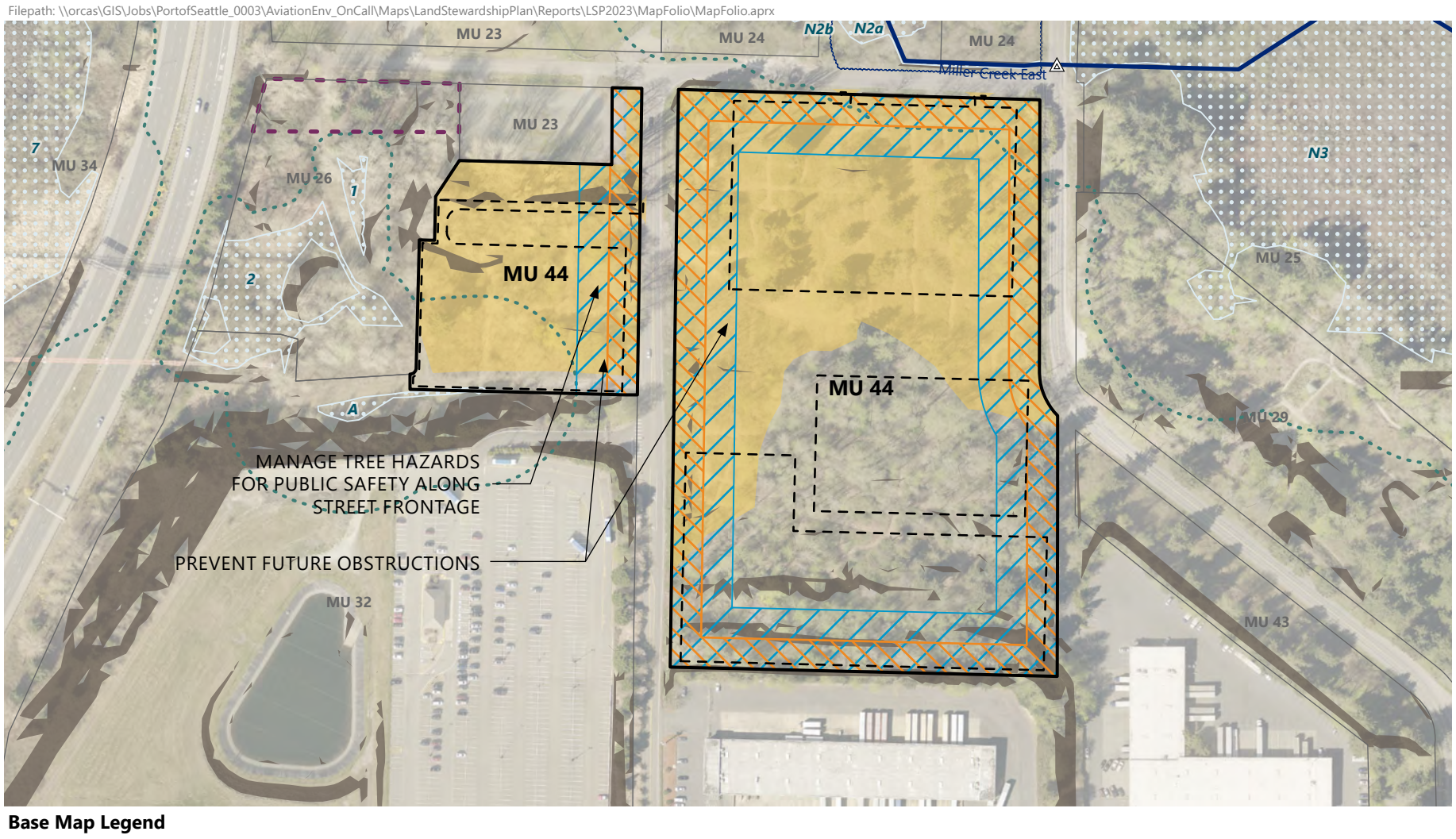

Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Community Planting Area
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Stewardship Opportunity Area
- Manage Invasive Species

Culverts
- Unknown

Site Description

- Airport Properties identify MU as the 13-Acre Parcel. MU 44 also includes the property just south of the 13-Acre Parcel.
- This MU will be affected by future development.
- Much of the MU is forest and shrub land cover, most of which is dominated by invasive species including Himalayan blackberry.

FLAT Assessment: Landscape Management Strategy

MU 44 is identified as public safety and maintenance and therefore did not undergo a FLAT assessment.

Site Acreage

16.5 Acres

Land Cover Analysis

0%	Buildings
1.2%	Impervious
0.2%	Dry Grass/Bare
61.3%	Forest
23.7%	Grass
13.6%	Shrub
0%	Water

Morning Heat Index Results:

Low Heat Index (average is below 60.4 degrees F)

Equity Score: Low

Management Unit 45

West Side Campus

LSP Action

Ecological Use: Potential Mitigation

Recommended Site-Based Management Actions

Identify Mitigation Opportunities
- Establish mitigation sites

Conduct Long-Term Mitigation Action
- Manage FCSP mitigation sites

Habitat Corridor
- Improve habitat within Walker Creek habitat corridor

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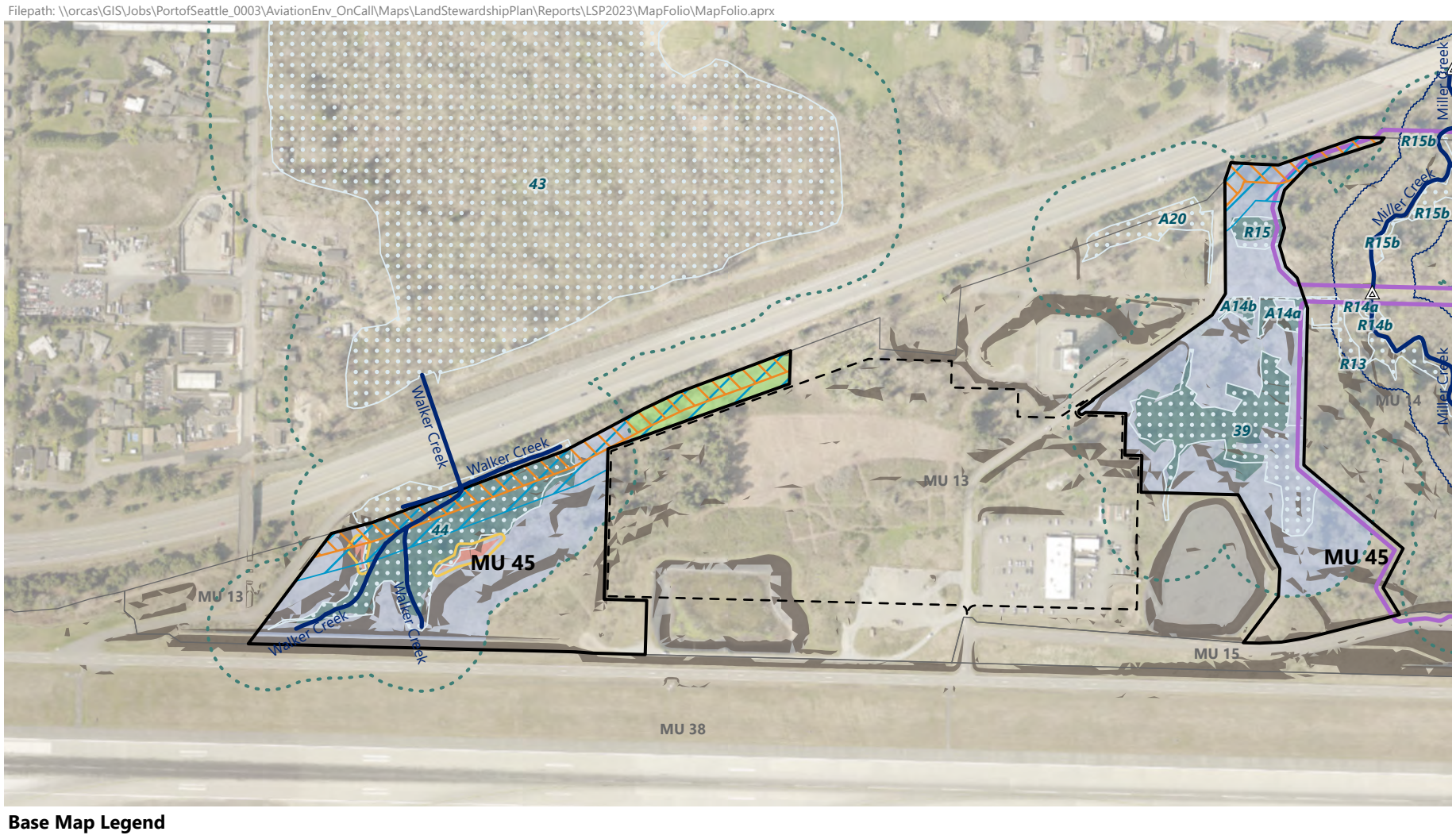
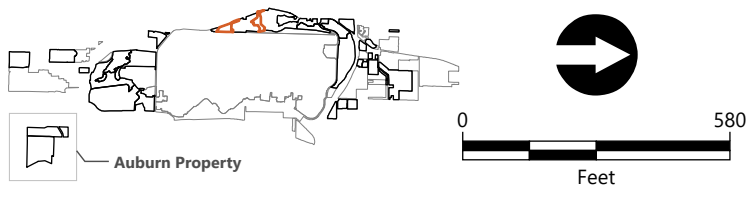


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- FCSP Mitigation Site
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Stewardship Opportunity Area
- Enhance Degraded Habitat
- Enhance Wetland Buffer
- Preserve Wetland
- Conduct Long-Term Mitigation Action

Culverts
- Unknown



Site Description

- North of this MU is a large mitigation site with a restrictive covenant offsetting impacts from the third runway and a city ROW.
- The MU is zoned as Open Space and has historically been used for agricultural purposes.
- The site is large and has three wetland areas. Wetland A is dominated by reed canary grass and seasonally ponded. Wetlands B and C are undergoing jurisdictional determination as wetlands.
- Wetland B is an artificial stormwater ditch dominated by mature cottonwood and Wetland C is a three-wetland complex dominated by reed canary grass with some cottonwood. A ditch likely connects Wetlands B and C and there is groundwater below the site.
- Wetlands and their buffers restrict development, and therefore this MU has limited opportunity for development.

FLAT Assessment: Landscape Management Strategy

MU 45 is addressed in further detail in the *Mitigation Site Opportunity Assessment* and therefore did not receive a FLAT assessment.

Site Acreage

19.7 Acres

Land Cover Analysis

0%	Buildings
2.5%	Impervious
1.3%	Dry Grass/Bare
61.2%	Forest
9.9%	Grass
25.1%	Shrub
0%	Water

Morning Heat Index Results:

Moderate Heat Index (aveage is between 60.4 and 62.6 degrees F)

Equity Score: Very Low

Management Unit 46

Tyee Golf Course East

LSP Action

Ecological Use: Potential Mitigation

Recommended Site-Based Management Actions

Identify Mitigation Opportunities
- Establish mitigation sites

Conduct Long-Term Mitigation Action
- Manage FCSP plantings

Habitat Corridor
- Improve habitat within Des Moines Creek habitat corridor

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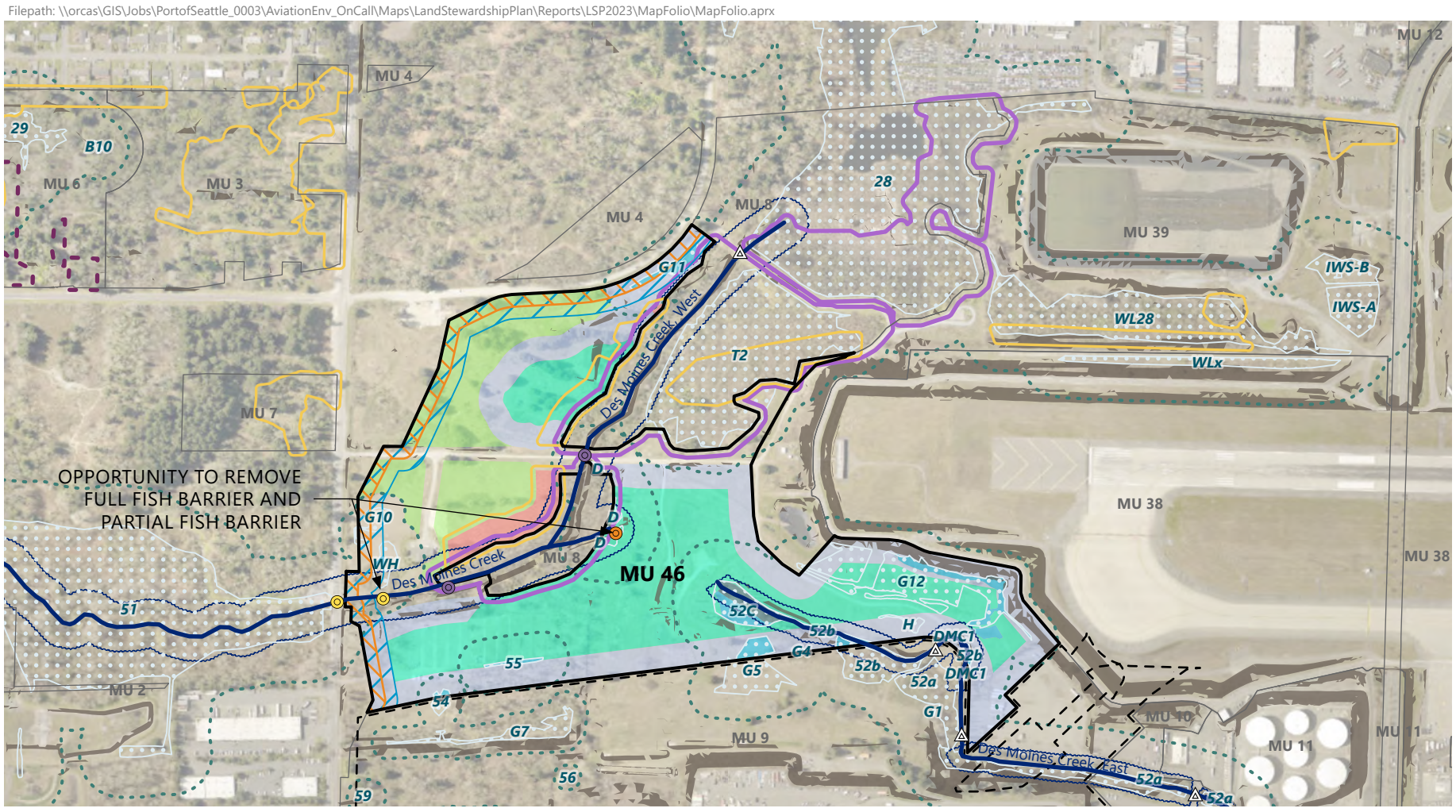
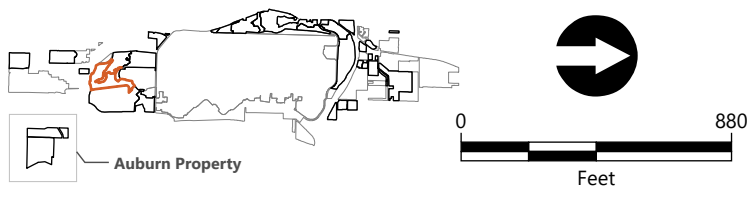


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- FCSP Mitigation Site
- Community Planting Area
- Public Hazard Area
- Slope > 40%
- Stream
- Wetland
- Stream Buffer
- Wetland Buffer

Stewardship Opportunity Area
- Enhance Degraded Habitat
- Enhance Wetland Buffer
- Enhance Wetland
- Preserve Wetland
- Re-Establish Wetland
- Conduct Long-Term Mitigation Action

Culverts
- Fish Passable
- Partial Fish Barrier
- Full Fish Barrier
- Unknown



Site Description

- MU 46 is at the south and of the SEA runway and includes portions of the former Tyee Golf Course that has been closed since 2014.
- The west fork of Des Moines Creek flows through this MU that is partially culverted under 20th Avenue South.
- This MU also contains a segment of the east fork of Des Moines Creek and multiple associated wetlands.
- This MU contains two FCSP mitigation planting areas.
- Within the former golf course, vegetation is characterized by non-native and invasive grasses, with clusters of trees and shrubs.
- Stream corridors are more densely vegetated with canopy and understory but also contain invasive species.

FLAT Assessment: Landscape Management Strategy

MU 46 is addressed in further detail in the *Mitigation Site Opportunity Assessment* and therefore did not receive a FLAT assessment.

Site Acreage

56.9 Acres

Land Cover Analysis

0.2%	Buildings
10.3%	Impervious
5.6%	Dry Grass/Bare
18.9%	Forest
56.4%	Grass
8.3%	Shrub
0.3%	Water

Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F)

Equity Score: Very Low

Management Unit 47

Auburn Mitigation Area

LSP Action

Ecological Use: Existing Mitigation

Recommended Site-Based Management Actions

Conduct Long-Term Mitigation Action

- Manage and maintain lands under mitigation restrictive covenant

Manage and Prevent Hazards

- Prevent hazards, including treefall, along ROWs

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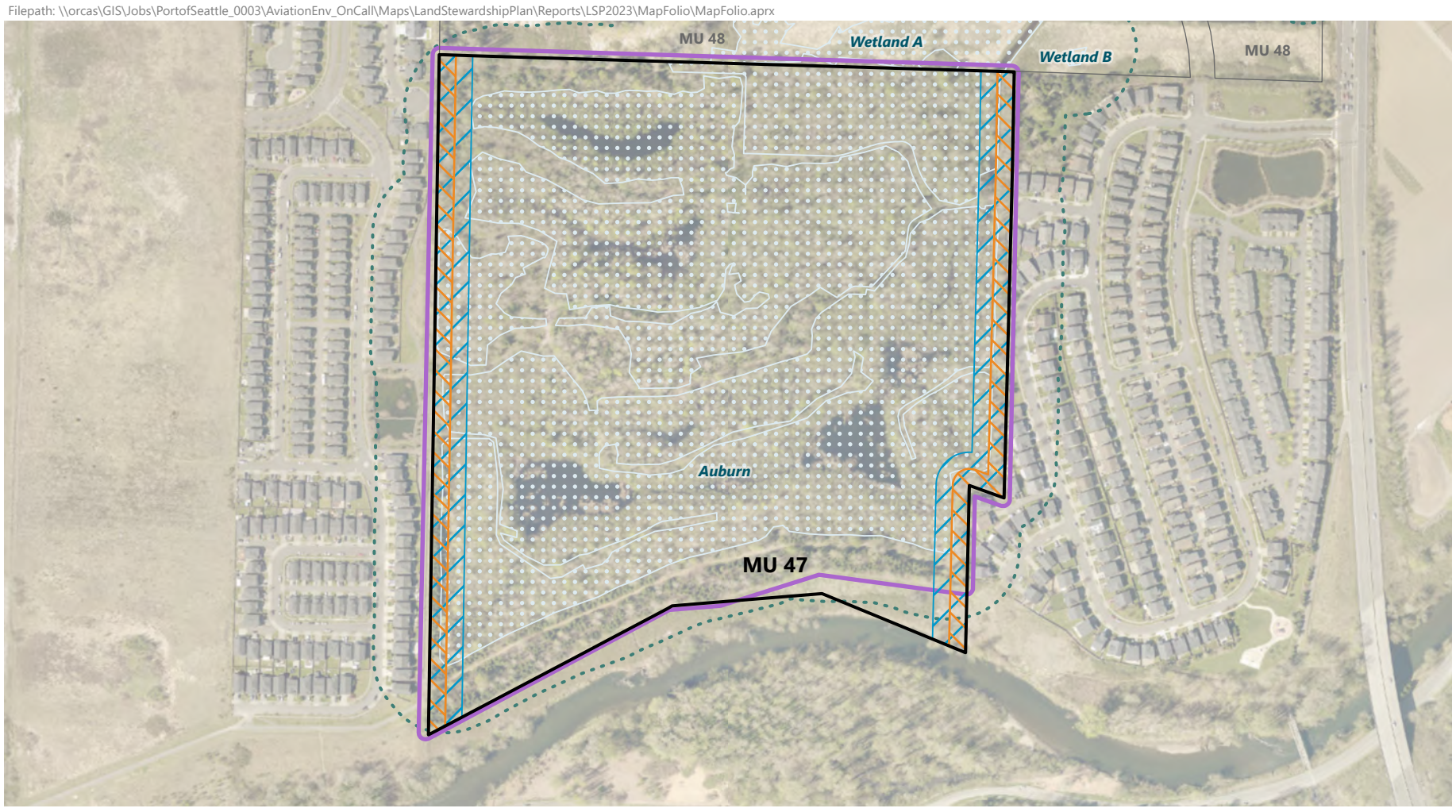

Site Description

- MU 47 is an undeveloped parcel in Auburn where South 277th Street crosses over the Green River, between two recent residential developments.
- The MU is dominated by series of 8 wetlands that are protected from development by a mitigation restrictive covenant.
- The MU is dominated by scrub shrub vegetation, including non-native species.
- This site's mitigation permit-required performance monitoring end in 2023. The Port will continue monitoring and maintaining the site to maintain invasive vegetation at maximum 10% cover and to protect high-value trees.

FLAT Assessment: Landscape Management Strategy

MU 47 is identified as a mitigation site and therefore did not undergo a FLAT assessment.

Site Acreage

67.3 Acres

Land Cover Analysis

2.3%	Buildings
4%	Impervious
9.6%	Dry Grass/Bare
74%	Forest
4.1%	Grass
6%	Shrub
0%	Water

Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F)

Equity Score: Very Low

Management Unit 48

Future Mitigation Bank

LSP Action

Ecological Use: Potential Mitigation

Recommended Site-Based Management Actions

Identify Mitigation Opportunities

- Establish mitigation bank

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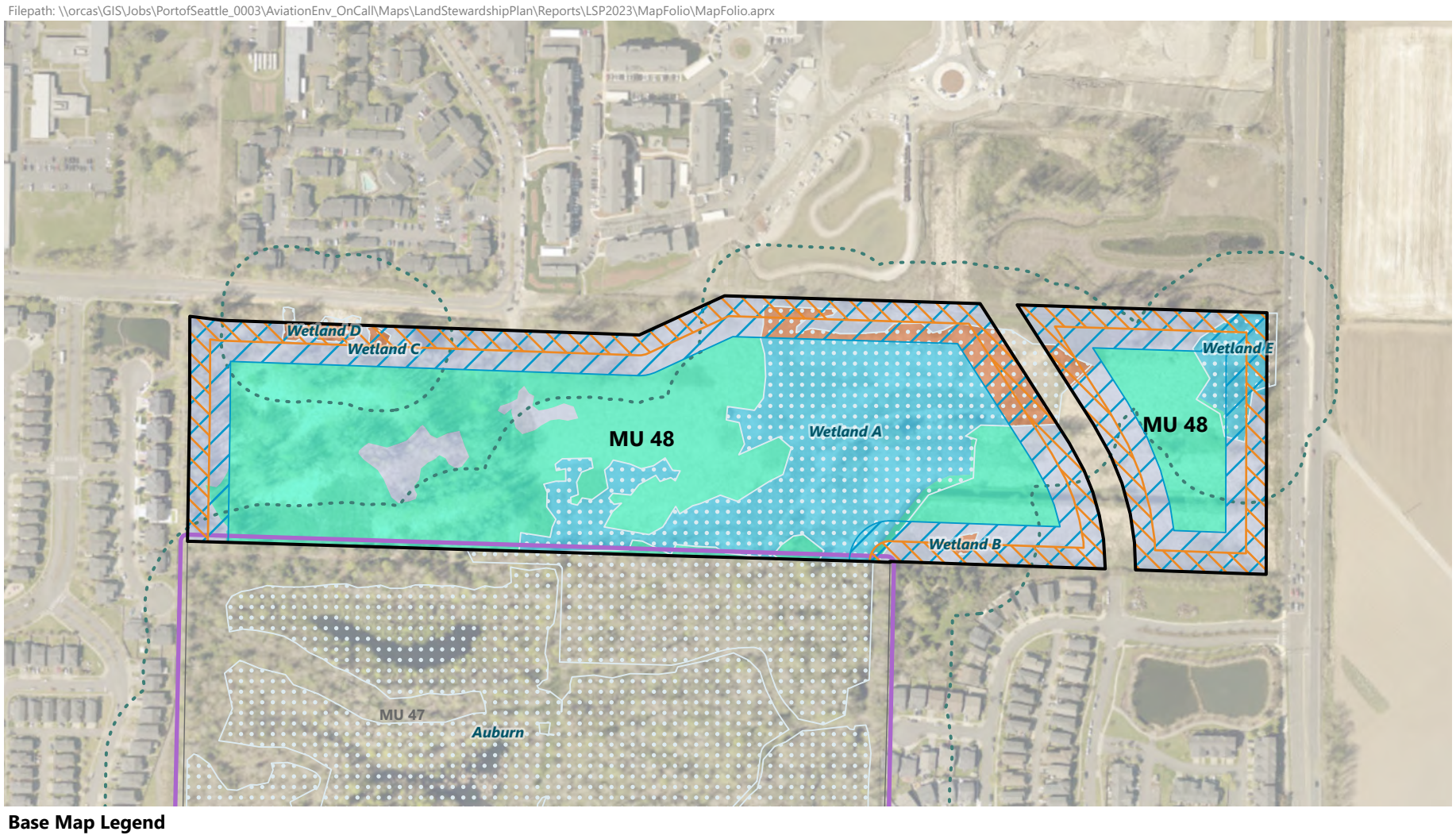
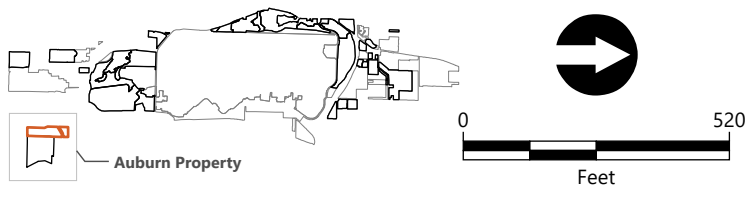


Base Map Legend

- LSP Management Unit
- Public Visual Corridor
- Public Safety - Tree Hazard Management Area
- Mitigation Restrictive Covenant
- Wetland
- Wetland Buffer

Stewardship Opportunity Area

- Enhance Wetland Buffer
- Enhance Wetland
- Re-Establish Wetland
- Potential Wetland Impact



Site Description

- MU 48 is in Auburn, at South 277th Street and I Street NE, between agricultural lands, new residential developments, and the Green River.
- This MU includes wetlands within a former agricultural site.
- Vegetation is predominantly grasses and shrubs with clusters of trees at the north and south ends of the MU.
- Invasive vegetation is present.

FLAT Assessment: Landscape Management Strategy

MU 48 is addressed in further detail in the *Mitigation Site Opportunity Assessment* and therefore did not receive a FLAT assessment.

Site Acreage

35.1 Acres

Land Cover Analysis

1.8%	Buildings
3.5%	Impervious
9.7%	Dry Grass/Bare
20%	Forest
50.6%	Grass
14.5%	Shrub
0%	Water

Morning Heat Index Results:

Moderate Heat Index (average is between 60.4 and 62.6 degrees F)

Equity Score: Very Low

Appendix D
Long-Term Mitigation Stewardship Plan

Long-Term Mitigation Stewardship Plan

Prepared for

Port of Seattle

By

Clearway Environmental LLC

and

Anchor QEA

Seattle, WA
December 2023

Clearway Environmental

ANCHOR QEA

Table of Contents

List of Tables

Figures

Appendices

List of Abbreviations

Forest Landscape Assessment Tool ……..FLAT

Geographic Information Systems ……...GIS

Land Stewardship Program ……LSP

Model Toxics Control Act…….MTCA

management units ……...MUs

Monitoring Year ……..MY

Port of Seattle…….Port

Port Construction Services…… PCS

Rough order of magnitude…… ROM

Third Runway Mitigation Long-Term Stewardship……..Mitigation Stewardship

Third Runway Mitigation Long-Term Stewardship Plan…….Plan

Third Runway Mitigation Sites ……Mitigation Sites

Washington Conservation Corps…… WCC

1. INTRODUCTION

The Port of Seattle (Port) has instituted a Land Stewardship Program (LSP) at Seattle-Tacoma International Airport with the intent to comprehensively improve stewardship practices across programs and processes. One component of the program is to implement long-term stewardship of permitted mitigation sites after the permitted performance monitoring period is complete.

Several of the Port of Seattle's Third Runway Mitigation Sites (Mitigation Sites) concluded their permit-required performance monitoring periods in 2022 and have transitioned out of the Port regulatory compliance program into Long-Term Mitigation Stewardship (Mitigation Stewardship). This Long-Term Mitigation Stewardship Plan (Plan) has been developed to provide a framework for long-term stewardship and includes:

- **Approach** to monitoring and maintaining Mitigation Sites for the next 10 years as part of Mitigation Stewardship
- **Menu of Maintenance Actions** for Mitigation Sites in Mitigation Stewardship with estimated rough order of magnitude costs
- **Monitoring Schedule** for Mitigation Stewardship for the next 10 years
- **Future Considerations and Approach** to updating the Plan in 10 years
- **2023 Mitigation Sites Monitoring Results** reviewing the 2023 monitoring completed at each Mitigation Site in Mitigation Stewardship including a review of the high-value tree inventory for each Mitigation Site.

1.1 Mitigation Sites Status

An overview of the Mitigation Sites' regulatory compliance monitoring schedule and the dates each Mitigation Site will transition to Mitigation Stewardship is shown in Table 1. Those Mitigation Sites listed as 'Complete' in the 2023 Monitoring Year (MY) are the Mitigation Sites that have transitioned into Mitigation Stewardship. Boxes shaded grey represent the last year of Regulatory Compliance Monitoring and the Sites' transition into Mitigation Stewardship. Location of the Mitigation Sites are shown in Figure 1.

Table 1: Third Runway Mitigation Sites Monitoring Schedule and Program Status

Site Name	Monitoring Year 0	2023 Monitoring Year (MY)	Regulatory Compliance Monitoring Schedule[a]									Notes
			2022	2023	2024	2025	2026	2027	2028	2029	2030	
Vacca Farm/Miller Creek Relocation	2007	Complete	●									Subject to Indirect Impacts
Miller Creek Buffer	2007	Complete	●									
Auburn[b]	2007	Complete	●									
Des Moines Nursery	2010	MY 13	●		●			●				Subject to 5-year monitoring for Indirect Impacts (including redelineation at Year 5) from stream restoration project.
Williams Property	2012	MY 10	●									
Tyee	2012	MY 10	●		●			●				Scheduled for Completion in 2027
Lora Lake	2020	MY 3	●	●	●	●	●	●	●	●	●	Scheduled for Completion in 2030

a Boxes shaded grey indicate the last year of Regulatory Compliance Monitoring.

b Monitoring in 2018 and 2020 was deferred 1 year (2017; 2019) to align with 2017 road removal action.

2. APPROACH

The following describes the approach to monitor and maintain Mitigation Sites in the next 10 years of Mitigation Stewardship.

2.1 Visual Surveys

The Port will have a trained ecologist conduct visual surveys at each Mitigation Site. Ecologists will physically walk each Mitigation Site to perform broad-scale, low-intensity monitoring. Visual observations will include mapping and recording maintenance needs, locations of invasive species, as well as conducting inspections for illegal use/dumping, hazard trees, and fence maintenance and repair.

2.2 Identify Maintenance Actions

Based on the visual survey monitoring work, the Port will use the menu of maintenance actions (see Section 3.0) to scope appropriate corrective maintenance actions for each Mitigation Site. The rough order of magnitude (ROM) planning costs will be used to develop a level of effort based on extent and severity of issues identified during the visual surveys.

2.3 Track Maintenance Actions

Identified maintenance actions for each Mitigation Site will be tracked in the Land Stewardship Geographic Information Systems (GIS) geodatabase that the Port manages. The tracking will include mapping areas where maintenance actions occurred and develop detailed metadata to capture key data attributes including:

- Date maintenance action was identified with description of issues
- Date maintenance action was completed

- Scope of completed maintenance action
- Cost of completed maintenance action

Georeferenced photos can also be included in the LSP GIS geodatabase to document issues and completed maintenance actions.

2.4 Survey High-Value Trees

A high-value tree survey will be conducted for each Mitigation Site (excluding Auburn and much of Vacca Farm and Lora Lake where the majority of the area is created wetland) within two years of the adoption of the LSP. The total planned inventory area includes existing mitigation areas where there is potential for high-value trees, including the Miller Creek Buffer site and the southern portion of the Vacca Farm and Lora Lake mitigation sites, and adjacent upland areas. The inventory area is divided into seven LSP management units (MUs). For the purposes of this report, high-value trees are defined as coniferous and big-leaf maples trees with a diameter at breast height of greater than 28” or trees with unique characteristics, scientific, or cultural value. The tree survey data will be tracked as part of the LSP GIS geodatabase.

2.5 Scope and Complete Maintenance Actions

Based on visual surveys and the menu maintenance actions described in Section 3, a maintenance scope will be defined for each Mitigation Site. The scope and associated cost of the maintenance will be determined by the site condition and effort needed to resolve site issues.

3. Menu of Maintenance Actions

A menu of recommended maintenance actions for issues found at the Mitigation Sites has been developed for use by the Port and are shown in Table 2, below. Multiple maintenance actions are identified to resolve potential Mitigation Site issues. The Port will decide which maintenance action is appropriate based on-site condition and severity of issue. ROM costs are provided as a planning tool. The costs assume the Port procures contractor services through Port Construction Services (PCS) or other means. The cost data is based on recent competitive bids from comparable project work. Labor and material costs were determined using current RSMeans Construction Cost data for the Seattle region. ROM costs assume manual labor to selectively remove invasive and provide site maintenance. Large equipment could damage existing native vegetation. ROM costs do not include construction contingencies or sales tax. If the Port used the Washington Conservation Corps (WCC) or Port maintenance staff, the costs would need to be analyzed based on current labor wages for those entities.

Table 2: Menu of Maintenance Actions

Issue	Maintenance Action	ROM Cost
Presence of Scotch broom *(Cytisus scoparius)* - King County Class B[3] noxious weed.	• Seedlings and young plants may be hand-pulled, before going to seed if possible. • Larger plants may be pulled using a weed wrench-type tool. Pulling disturbs the soil and creates ideal conditions for broom seed germination, so sites will need to be carefully monitored for new growth. • Cutting can also be an effective control method for older plants that are greater than 2" in diameter and no longer green at the base. Cut stems as close to the ground as possible during the summer drought in late July to August, but ideally before plants go to seed. Monitor for re- growth and cut again. If in seed, remove and disposed of in trash. • Expect the level of control work to be intensive for the first several years due to seed banks, soil disturbance that occurs when pulling or digging, and regrowth of cut plants.	• Manual removal for seedlings: $11,000/acre • Manual removal for mature plants: $21,800/acre • Cutting stems: $10/each
Presence of Tansy ragwort *(Jacobaea vulgaris)* – King County Class B[1] noxious weed.	• For small infestations, tansy ragwort can be controlled through hand pulling and/or digging. Plants are easiest to pull after plants have bolted, but before flowering and when the soil is moist. When pulling, try to remove as much of the root as possible to prevent regrowth. • Control efforts are most effective before the plants flower. If budding or flowering, the flowering parts must be removed from site and disposed of in trash. If the buds/flowers are left on the plants, the plants will still produce seed, despite being uprooted or sprayed.	• Manual removal: $11,000/acre
vacPresence of Policeman's helmet *(Impatiens glandulifera)* – King County Class B[1] noxious weed.	• Policeman's helmet has shallow roots that should be pulled or dug up in the spring or early summer when the soil is still moist and before the plant develops seed capsules.	• Manual removal: $11,000/acre

Issue	Maintenance Action	ROM Cost
	• If the plants are in flower, carefully place a bag around the entire flower head cluster to prevent the seeds from escaping, then remove the flower/seed head. Vegetative parts may be left on site to compost. Flowers/seedheads should be disposed of in trash.	
Presence of Yellow archangel *(Lamiastrium galeobdolon)* – King County Class B[2] noxious weed.	• Roots are not deep, so it can be hand-pulled, but this is very labor intensive. Any root fragment left behind can start a new plant. • Herbicides can be effective, especially if combined with manual control and monitoring for surviving plants. Take care to avoid native vegetation by selectively spot-spraying. • Using 3% Auquamaster and 2% AgriDex may be an effective herbicide solution.	• Manual removal: $21,800/acre • Herbicide application: $3/square foot
Presence of Knotweed (*Polygonum spp.) – King* County Class B[3] noxious weed.	• Knotweed should be controlled chemically. The best time to chemically control knotweed in Washington State is August through early October (when the plant is in the flower bud stage). • However, for foliar treatment, the plants may be over 10 feet tall at the time of treatment and hard to spray without significant chemical drift. If this is a concern, plants can be bent or cut in June or July and will regrow to approximately 4 feet in about 6-8 weeks.	• Cutting stems: $10/each • Herbicide application: $3/square foot
Presence of Spotted jewelweed *(Impatiens capensis)* – King County Class C[2] noxious weed.	• There is limited information available on control methods for spotted jewelweed. • Spotted jewelweed has shallow roots that can be pulled or dug up in the spring or early summer when the soil is still moist and before the plant develops seed capsules. • If the plants are in flower, carefully place a bag around the entire flower head cluster to prevent the seeds from escaping, then remove the	• Manual removal: $11,000/acre

Issue	Maintenance Action	ROM Cost
	flower/seed head. Vegetative parts may be left on site to compost. Flowers/seedheads should be disposed of in trash. • Plants may have some seeds that remain in the seedbank after the first year, so it is important to manage and monitor sites for regrowth.	
Presence of Reed canary grass (*Phalaris arundinacea)* – King County Class C[2] noxious weed.	• Reed canary grass can be controlled with shade, so planting shrubs/trees in areas with RCG can help keep it at a manageable level. • Manual control is not usually a viable option, as it is difficult to remove all the rhizome fragments. • Herbicide applications can be effective, but large areas may require several years of treatment to exhaust the seed bank. Spot spray small infestations, taking care to avoid damaging surrounding vegetation.	• Plant shrubs/trees (1-gallon) at 6 foot on center: $30/each ($X6.63for labor and $23.37 for plant material) • Plant grasses/forbs (bare root) at 4 foot on center: $4/each ($0.30 for labor and $3.70 for plant material) • Herbicide application: $3/square foot
Presence of Teasel (*Dipsacus fullonum)* – King County Class C[2] noxious weed.	• Small infestations, when the soil is moist and possibly with the aid of a weed wrench, dig up rosettes and pull flowering stalks. • If flowers are or were present, or the head appears beige or brown in color, those flower heads should be cut and bagged for disposal, since they can have seeds. • A dense planting of shrubs or grasses and forbs can inhibit future teasel establishment	• Clear and grub: $11,000/acre • Plant shrubs/trees (1-gallon) at 6 foot on center: $30/each ($6.63 for labor and $23.37 for plant material) • Plant grasses/forbs (bare root) at 4 foot on center: $4/each ($0.30 for labor and $3.70 for plant material)
Presence of Italian arum *(Arum italicum)* – King County Class C[2] noxious weed.	• There is little known about an effective control method for this plant. Herbicide information is limited. • Carefully digging around the stem, all the way down to the tuber, removing the tuber and daughter tubers, and disposing the tubers in a sealed bag in the garbage, can provide some control after many years.	• Manual removal: $21,800/acre

Issue	Maintenance Action	ROM Cost
	• Do not move soil with Italian arum to new locations or to compost piles as tubers may be spread and start new infestations. • Not noted in sites monitored but noted in adjacent sites. Only detectable in spring and early summer.	
Presence of European hawthorn *(Crataegus monogyna)* – King County Class C^2 noxious weed.	• Seedlings can be hand-pulled. • For larger trees, herbicide is the most effective control. • Tree injection: EZ-ject bullets can be injected into the tree's trunk • Cut-stump treatment: Using Glyphosate (RoundUp or other brands) or triclopyr (found in many brush control herbicides). The stem should be cut close to the ground and the herbicide should be applied directly on the stump, immediately after cutting. • Frilling: Make deep, 45-degree angle cuts into the bark, around the stem. Herbicide should be immediately put into the cuts.	• Manual removal of seedlings: $11,000/acre • Herbicide application: $3/square foot • Cutting stems: $10/each
Presence of English ivy *(Hedera helix)* on tree trunks and within understory – King County Class C^2 noxious weed.	• Hand-pulling is the most effective method of control for ivy. Dig and pull all roots, however older stems do not re-sprout well, so leaving some root behind is likely not a problem. • Ivy growing up tree trunks can be controlled by removing all the vines from the lower trunk of the tree (only as high as you can comfortably reach). Vines can be composted on site, but piles should be elevated so they do not have ground contact to re-root. This is an easy plant for volunteers to remove.	• Manual ground removal: $21,800/acre • Ivy removal from trees: $8,000/acre
Presence of Himalayan blackberry *(Rubus armeniacus)* and Evergreen blackberry *(Rubus laciniatus)* – King County Class C^2 noxious weeds.	• The most effective control method is manual removal of root balls and major side roots, followed by herbicide applications of regrowth. • Infestations that are inter-mixed with desirable plants can be spot sprayed with herbicide – while avoiding spraying adjacent desirable plants. Glyphosate is most effective on blackberry in September to October, when	• Manual removal: $21,800/acre • Herbicide application: $3/square foot

Issue	Maintenance Action	ROM Cost
	canes are actively growing and after berries have formed. Fall treatments should be conducted before the first frost.	
Presence of Horsechestnut *(Aesculus hippocastanum)* – King County Weed of Concern.	• Seedlings can be hand-pulled. • For larger trees, herbicide is the most effective control. • Tree injection: EZ-ject bullets can be injected into the tree's trunk • Cut-stump treatment: Using Glyphosate (RoundUp or other brands) or triclopyr (found in many brush control herbicides). The stem should be cut close to the ground and the herbicide should be applied directly on the stump, immediately after cutting. • Frilling: Make deep, 45-degree angle cuts into the bark, around the stem. Herbicide should be immediately put into the cuts.	• Manual removal of seedlings: $11,000/acre • Herbicide application: $3/square foot • Cutting stems: $10/each
Presence of Field/hedge bindweed (*Convolvulus arvensis* and *Convolvulus sepium)* – King County Weed of Concern.	• Apply glyphosate to the bindweed in fall when the bindweed is actively growing; however, spring treatment has the additional benefit of reducing seed production, vigor, and spread of the plant. • Generally, additional applications need to be made when the bindweed regrows.	• Herbicide application: $3/square foot
Presence of Norway maple (*Acer plantanoides)* – King County Weed of Concern	• Seedlings can be hand-pulled. • For larger trees, herbicide is the most effective control. • Tree injection: EZ-ject bullets can be injected into the tree's trunk • Cut-stump treatment: Using Glyphosate (RoundUp or other brands) or triclopyr (found in many brush control herbicides). The stem should be cut close to the ground and the herbicide should be applied directly on the stump, immediately after cutting. • Frilling: Make deep, 45-degree angle cuts into the bark, around the stem. Herbicide should be immediately put into the cuts.	• Manual removal of seedlings: $11,000/acre • Herbicide application: $3/square foot • Cutting stems: $10/each

Issue	Maintenance Action	ROM Cost
Presence of English holly (*Ilex aquifolium)* – King County Weed of Concern.	• Seedlings can be hand-pulled. • For larger trees, herbicide is the most effective control. • Tree injection: EZ-ject bullets can be injected into the tree's trunk • Cut-stump treatment: Using Glyphosate (RoundUp or other brands) or triclopyr (found in many brush control herbicides). The stem should be cut close to the ground and the herbicide should be applied directly on the stump, immediately after cutting. • Frilling: Make deep, 45-degree angle cuts into the bark, around the stem. Herbicide should be immediately put into the cuts.	• Manual removal of seedlings: $11,000/acre • Herbicide application: $3/square foot • Frilling (assume labor requires 5 cuts): $50/each
Presence of Bird cherry *(Prunus avium)* – King County Weed of Concern.	• Seedlings can be hand-pulled. • For larger trees, herbicide is the most effective control. • Tree injection: EZ-ject bullets can be injected into the tree's trunk • Cut-stump treatment: Using Glyphosate (RoundUp or other brands) or triclopyr (found in many brush control herbicides). The stem should be cut close to the ground and the herbicide should be applied directly on the stump, immediately after cutting. • Frilling: Make deep, 45-degree angle cuts into the bark, around the stem. Herbicide should be immediately put into the cuts.	• Manual removal of seedlings: $11,000/acre • Herbicide application: $3/square foot • Frilling (assume labor requires 5 cuts): $50/each •
Presence of Cherry laurel (*Prunus laurocerasus)* – King County Weed of Concern.	• Seedlings can be hand-pulled. • For larger trees, herbicide is the most effective control. • Tree injection: EZ-ject bullets can be injected into the tree's trunk ○ Cut-stump treatment: Using Glyphosate (RoundUp or other brands) or triclopyr (found in many brush control herbicides). The stem should be cut close to the ground and the herbicide should be applied directly on the stump, immediately after cutting.	• Manual removal of seedlings: $11,000/acre • Herbicide application: $3/square foot • Frilling (assume labor requires 5 cuts): $50/each •

Issue	Maintenance Action	ROM Cost
	• Frilling: Make deep, 45-degree angle cuts into the bark, around the stem. Herbicide should be immediately put into the cuts. • Branches and stems may re-root if left in ground contact.	
Presence of European mountain ash (*Sorbus aucuparia)* – King County Weed of Concern.	• Seedlings can be hand-pulled. • For larger trees, herbicide is the most effective control. • Tree injection: EZ-ject bullets can be injected into the tree's trunk • Cut-stump treatment: Using Glyphosate (RoundUp or other brands) or triclopyr (found in many brush control herbicides). The stem should be cut close to the ground and the herbicide should be applied directly on the stump, immediately after cutting. • Frilling: Make deep, 45-degree angle cuts into the bark, around the stem. Herbicide should be immediately put into the cuts.	• Manual removal of seedlings: $11,000/acre • Herbicide application: $3/square foot • Cutting stems: $10/each • Frilling (assume labor requires 5 cuts): $50/each •
Presence of Black locust *(Robinia pseudoacacia)* – King County Weed of Concern.	• Seedlings can be hand-pulled. • For larger trees, herbicide is the most effective control. • Tree injection: EZ-ject bullets can be injected into the tree's trunk • Cut-stump treatment: Using Glyphosate (RoundUp or other brands) or triclopyr (found in many brush control herbicides). The stem should be cut close to the ground and the herbicide should be applied directly on the stump, immediately after cutting. • Frilling: Make deep, 45-degree angle cuts into the bark, around the stem. Herbicide should be immediately put into the cuts.	• Manual removal of seedlings: $11,000/acre • Herbicide application: $3/square foot • Cutting stems: $10/each • Frilling (assume labor requires 5 cuts): $50/each •
Presence of Bittersweet nightshade *(Solanum dulcamara)* – King County Weed of Concern.	• For young plants and small infestations, hand-pull the stem closest to the ground and pull or dig up the roots, taking care not to break the slender roots. Manual control can cause considerable sediment disturbance in and near creek beds, so measures should be taken to minimize impacts during work, and all applicable "fish windows" should be followed to avoid damaging fish habitat during spawning seasons.	• Manual removal: $21,800/acre

Issue	Maintenance Action	ROM Cost
Presence of Portuguese laurel (*Prunus lusitanica)* – King County Weed of Concern.	• Seedlings can be hand-pulled. • For larger trees, herbicide is the most effective control. • Tree injection: EZ-ject bullets can be injected into the tree's trunk • Cut-stump treatment: Using Glyphosate (RoundUp or other brands) or triclopyr (found in many brush control herbicides). The stem should be cut close to the ground and the herbicide should be applied directly on the stump, immediately after cutting. • Frilling: Make deep, 45-degree angle cuts into the bark, around the stem. Herbicide should be immediately put into the cuts. • Branches and stems may re-root if left in ground contact.	• Manual removal of seedlings: $11,000/acre • Herbicide application: $3/square foot • Cutting stems: $10/each • Frilling (assume labor requires 5 cuts): $50/each •
Presence of Common periwinkle *(Vinca minor)* – King County Weed of Concern	• Plants can be pulled from moist soil. • Cutting or mowing, followed by raking up the vines can help keep periwinkle vines from spreading. • 1 to 2 percent solution of tryclopyr or glyphosate can be applied to new growth, or to fresh growth after being cut.	• Manual removal: $11,000/acre • Mowing: $1,640/acre • Herbicide application: $3/square foot
Hazard trees/limbs	• Prune/remove any hazard limbs at the borders of Mitigation Sites to eliminate possible damage to neighboring private properties.	• Prune limbs/tree thinning: $10/each
Fence line repair	• Repair holes in fences and add padlocks to fence openings that do not have secure access. • Replace any sections of fencing that is no longer functional	• Repair hole: $36/each • Add padlock: $30/each • Repair sections of fence: $36/linear foot
Illegal use/dumping	• Areas of dumping/trash need to be removed. Instances of illegal use/encampments will be addressed by Port staff.	• Trash removal: cost will depend on extent and type of trash removal and will need to be estimated on a site issue by site issue basis

Issue	Maintenance Action	ROM Cost
Limited organic layer	• Install mulch to a depth of 3 inches	• Install mulch (3 inches): $6.34/square yard ($2.77 for labor and $3.57 for material)
Limited native understory	• Plant 1-gallon shrubs and groundcovers spaced 6'O.C. • Install fertilizer at planting location • Install mulch to a depth of 3 inches	• Plant shrub/groundcover (1-gallon): $30/each ($X6.63for labor and $23.37 for plant material) • Install fertilizer: $164.53/acre (assuming mechanical spread; $158.70 for labor and $5.83 for material) • Install mulch (3 inches): $6.34/square yard ($2.77 for labor and $3.57 for material)
Limited tree canopy	• Plant 1-gallon conifer tree • Plant 1-gallon deciduous tree • Install fertilizer at planting location • Install mulch to a depth of 3 inches	• Plant deciduous or conifer tree (1-gallon): $30/each ($X6.63for labor and $23.37 for plant material) • Install fertilizer: $164.53/acre (assuming mechanical spread; $158.70 for labor and $5.83 for material) • Install mulch (3 inches): $6.34/square yard ($2.77 for labor and $3.57 for material)

1 Regulated Noxious weeds: control is required for these species in King County.

2 Non-Regulated Noxious weeds: not designated for control in King County, but recommended.

3 Selective: Requires control in specific parameters. (King County DNRP 2023)

4. MONITORING SCHEDULE

This Plan identifies a 10-year monitoring schedule for Mitigation Stewardship starting in 2023. 2023 monitoring has been completed for the Mitigation Sites that transitioned from the Regulatory Compliance Program to Mitigation Stewardship and findings are summarized in Section 6. During the 10-year schedule, monitoring of each Mitigation Site will occur to ensure new invasive plant species and infestations are not establishing, as well as to monitor for beaver activity, illegal activities, hazard trees, and infrastructure repair. Monitoring will inform necessary maintenance actions.

Table 3 provides a breakdown of recommended monitoring tasks with ROM planning costs through 2032. The breakdown assumes a monitoring frequency based on current conditions at the sites that have transitioned to Mitigation Stewardship, specifically:

- Vacca Farm/Miller Creek Relocation: monitor site every 2 years
- Miller Creek Buffer: monitor site every 2 years
- Auburn: monitor site every 5 years

For sites still within the Regulatory Compliance Program, the monitoring frequency is assumed to be every 5 years. At the time these sites transition to Mitigation Stewardship, that assumption will be confirmed.

ROM costs are based on acreage and expected level of effort to conduct visual survey, tracking and tree inventory survey. Monitoring costs presented in the table are based on previous 2023 monitoring efforts at Auburn, Vacca Farm, and the Miller Creek Area escalated at 4% each year. Tree inventory survey cost is based on the completed 2023 tree survey for Miller Creek and Vacca Farm sites extrapolated for the 2024/2025 tree inventory survey area.

Table *3: Monitoring Schedule with ROM Costs for Planning*

Monitoring Site and Task	ROM Annual Cost										Notes
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	
Vacca Farm/Miller Creek Relocation	-	$2,300	-	$2,500	-	$2,700	-	$2,900	-	$3,200	Transitioned to Mitigation Stewardship in 2023
Miller Creek Buffer	-	$5,800	-	$6,200	-	$6,700	-	$7,300	-	$7,900	
Auburn	-	-	-	-	$2,600	-	-	-	-	$3,200	
Des Moines Nursery	-	-	-	-	-	$2,000	-	-	-	-	Will transition to Mitigation Stewardship in 2029[1,4]
Williams Property	-	-	-	-	-	$1,400	-	-	-	-	Will transition to Mitigation Stewardship in 2029[1]
Tyee	-	-	-	$2,500	-	-	-	-	$3,000	-	Will transition to Mitigation Stewardship in 2027[1]
Lora Lake	-	-	-	-	-	-	-	-	-	$3,200	Will transition to Mitigation Stewardship in 2030[1, 2]
Tree Inventory survey	$20,000	-	-	-	-	-	-	-	-	-	A high-value tree inventory for all Mitigation Sites will be completed by 2025 as described in Section 2.4.[3]

1 These sites are still within the Regulatory Compliance Program. The ROM annual cost assumes that once released to Mitigation Stewardship, the monitoring frequency will be every 5 years. However, at the time these sites transition to Mitigation Stewardship, that assumption will be confirmed.

2 At the time Lora Lake transitions to Mitigation Stewardship, it will have completed annual monitoring for the last 10 years. Consequently, Mitigation Stewardship monitoring will occur 3 years following its transition date and the be monitored every 5 years going forward.

3 The current estimate assumes all tree inventory work can occur in 2024. However, based on staff workload, this work may also occur in 2025.

4 Des Moines Nursery is transitioning to Mitigation Stewardship in 2027. However, the City of Burien is constructing a stream project that will impact this mitigation area. That construction will be completed in 2024, and related monitoring for that stream project will be completed in 2029. Consequently, the first year of stewardship monitoring is 2029.

5. Future Considerations and Approach

After year 2033, an updated Plan will be necessary to continue Mitigation Stewardship. The scope and frequency of monitoring will be considered based on existing site conditions. Many of the Mitigation Sites are in highly urban areas and may continue to be prone to invasive species infestation and illegal use. In this case, two-year monitoring events may still be needed. If the sites are self-sustaining habitat conditions in line with stewardship goals, less frequent monitoring may be appropriate.

In addition to reduced frequency, other methods could be considered. For example, the Forest Landscape Assessment Tool (FLAT) rapid assessment is a method to quickly define forest ecological health and potential threats (Cieko 2016). FLAT gathers site data through a land cover desktop analysis and confirms conditions with windshield site visits. The data then informs the appropriate maintenance and restoration recommendations. Applying the FLAT methodology to the Mitigation Sites would be consistent with the LSP approach for ecological areas at SEA.

5.1 Restoration and Invasive Considerations

As the Mitigation Sites transition from the permit-required monitoring period into Long-term Stewardship, the management effort will depend on the Sites' conditions and ideally will decrease over time. A restoration best management practice is the four-phase approach to restoration fieldwork (GSP, 2022), which breaks restoration efforts down into four phases. Of the four phases below, most Sites are now at Phase 3 and 4 with the focus placed on maintaining invasive species presence and ensuring success of native planted species. Some phases may need to be revisited if presence of invasive species continues to be an issue.

Phase 1: Invasive plant removal

This phase aims to clear the site of invasive plants, focusing on one small area at a time, in order to ensure thoroughness and minimize regrowth.

Phase 2: Secondary invasive removal and planting

Before planting, a second round of invasive removal is done to target any regrowth before it spreads, and to prepare the site for young native plants to be installed.

Phase 3: Plant establishment and follow-up maintenance

This phase repeats invasive plant removal, or weeding, along with mulching and watering newly planted native plants until they are established. Although native plants have adapted to the area's dry summer climate, recently installed plants may experience transplant shock, which affects root and shoot health. Therefore, most plants require at least 3-5 years of establishment care to help ensure their survival.

Phase 4: Long-term stewardship and monitoring

The final phase is long-term site stewardship, including monitoring to provide information for ongoing maintenance. Maintenance typically will consist of spot removal of invasive regrowth and occasional planting where survivorship of existing plants is low.

This four-phase approach should be utilized in undertaking the stewardship of these sites. The Auburn site seems to fit within Phase 4, with long-term stewardship and monitoring, whereas the sections of Miller Creek Buffer and Vacca Farm that have large patches of invasives might benefit from a Phase 2 approach.

Other Restoration and Management Considerations

- Removing invasive species can create an opening for re-invasion if follow-up management does not occur. For any area where an invasive monoculture is being removed, the area should be re-planted with appropriate native plants, so invasive plants will not re-establish. Planting a variety of appropriate native plant species will help create competition with weed seedlings trying to establish. Areas in Miller Creek Buffer that have large swaths of jewelweed are an example of appropriate areas to replant once the jewelweed is removed.
- When controlling large, invasive trees like black locust, it is important to have an understory that is relatively devoid of sun-loving invasives, like blackberry. When removing invasive trees, make sure to remove and control blackberries before removal of tree canopy. Also, under-planting invasive trees with native trees and allowing them to establish before removing invasive trees can help mitigate the canopy loss when removing invasive trees.
- One prioritization approach to restoration is to prioritize the removal of small infestations before they spread and become more difficult and expensive to control, as opposed to starting restoration efforts by tackling larger infestations, which often take longer.
- Herbicide spraying within 60 feet of a water body requires the use of an herbicide formulated for aquatic settings. Herbicides used in an aquatic setting and not formulated or labeled for use there (like RoundUp™) are likely toxic to fish and other non-target species and is considered an illegal application.
- When possible, try not to remove trees and brushy plants from April to July to avoid disturbing nesting birds and do not spray herbicides when pollinators are active on plants.
- Make sure to clean shoes, clothing, and equipment when leaving infested areas to prevent spreading seeds to new locations.

6. 2023 Mitigation Sites Monitoring Results and Maintenance Recommendations

6.1 Results

Following the approach defined in Section 2, the 2023 field effort included low-intensity, broad scale visual surveys of Vacca Farm, Miller Creek Buffer, and Auburn Sites. 2023 is the first year any Mitigation Sites are entering Mitigation Stewardship.

Two ecologists from Clearway Environmental LLC and a representative from the Port conducted site visits to each site in July of 2023. The team physically walked each site to perform broad-scale, low-intensity monitoring. Visual observations included maintenance needs, locations of invasive species, as well as conducting inspections for illegal use/dumping, hazard trees, and fence maintenance and repair.

To track conditions at the sites, handheld, sub-meter GPS units were used for GIS mapping. GIS data collected in the field will be integrated into the LSP GDB that the Port maintains. Locations of significant areas (larger than approximately 5x5 feet) of invasive species were mapped. Acreage of coverage was calculated by species and site, which can be used for future monitoring and tracking of maintenance progress. Areas that lacked native plant cover were mapped and marked as potential areas for replanting. Instances of fence line repair, hazard tree locations, illegal use, and other maintenance issues were recorded, and GIS locations collected. Several photos were taken at each site, showing general conditions or a specific issue, and are shown in Appendix A. Georeferenced photo locations are shown on the figures of each site (Figures 2, 3, and 4).

High-value trees located in the Miller Creek Buffer site (MU 14) and the Lora Lake site (part of MU 17) were surveyed in early 2023. The high-value tree inventory memorandum from this survey is included in Appendix B.

6.2 Invasive Species Cover

Amount of cover of the dominant invasives species, by acre and by site, is shown in Table 4, below, and will be used to estimate costs and effort.

Table *4: Invasive Species Percent Cover*

	Vacca Farm	Miller Creek Buffer	Auburn	Total
Blackberry	0.26	2.81	0.42	3.50
Ivy	0.18	10.4	0.04	10.66
Reed Canary Grass	0.28	--	trace	0.28
Jewelweed	2.0	0.01	0.17	2.21

A summary of current conditions at each Mitigation Site visited is included in the sections below and include general site conditions, presence of invasive species, and tree survey data collected, where applicable.

6.3 Vacca Farm

Vacca Farm has large monocultures of jewelweed, which was the most prevalent invasive plant on site. Its area totals approximately 2 acres (see Figure 2). Small patches of ivy, reed canary grass, and blackberry were also present. Blackberry and reed canary grass are not shade tolerant, so their inability to successfully invade this site is likely due to the site's dense tree canopy. Ivy was also not a significant issue here, likely due to higher soil moisture, which is does not tolerate well. Other invasives noted on site include – European hawthorn, Portuguese laurel, cherry laurel, English holly, European ash, and common periwinkle.

The large swaths of jewelweed growing on the banks of Miller Creek need to be controlled. Since jewelweed is so widespread within the site, manual removal would be a significant undertaking. There is limited information available on control methods for spotted jewelweed, however aquatic versions of products containing glyphosate or triclopyr may be effective if applied to actively growing plants. Removing invasive species can open a habitat up to re-invasion if follow up management does not occur. Native planting should follow any removal of jewelweed infestation. See Table 2 for additional information about jewelweed control.

Due to a fairly contiguous canopy, only 4 small areas were noted as having planting potential (see Figure 2).

There was beaver activity noted at the northeast corner of the Vacca Farm site, dividing Vacca Farm from the Lora Lake site. The beaver dam is approximately 50 feet across and is causing some flooding and altering hydrology. There is significant ponding occurring on the northern side of the dam, on the Lora Lake side. Its location is shown on Figure 2 and Port staff has been notified of its presence, in order to move forward with removal plans by wildlife staff. In order to accommodate beaver use without impacting site restoration, the Port should develop a beaver management plan. The plan should identify actions to take, and those action should be integrated into the Mitigation Stewardship menus of maintenance actions.

Vacca Farm is still being monitored for Indirect Impacts from the Lora Lake Model Toxics Control Act Mitigation (MTCA). The high-value tree inventory performed at MU 17 shows 6 high value trees (see Appendix B). Note that the boundary of MU 17 includes Lora Lake and Vacca Farm sites; Lora Lake is not a Mitigation Site included in the 2023 Plan.

Table 5 provides a summary of the issues, maintenance actions, and ROM costs identified for Vacca Farm based on the 2023 monitoring. The summary applies the Port-wide maintenance actions identified in Table 2 to the field collected data, specifically the delineated areas of invasive species and location of fence repair.

Table 5: Maintenance Actions Identified at Vacca Farm

Issue	Maintenance Action	ROM Cost
• Presence of Himalayan blackberry, English ivy, Spotted jewelweed, Reed canary grass, and Common periwinkle	• Manual removal/hand pulling of all roots, root balls, and major side roots of blackberry, English ivy, and spotted jewelweed. • Herbicide application for blackberry, reed canarygrass, and periwinkle – while avoiding spraying adjacent desirable plants. • Removal of all the vines from the lower trunk of the tree and composting on site. • If jewelweed is in flower, carefully place a bag around the entire flower head cluster to prevent the seeds from escaping, then remove the flower/seed head. Vegetative parts may be left on site to compost. Flowers/seedheads should be disposed of in trash. • Plant shrubs/trees in areas with RCG. • Cutting or mowing of periwinkle.	$123,000
• Fence line repair	• Repair holes in fences and add padlocks to fence openings that do not have secure access.	• Repair hole: $36/each • Add padlock: $30/each

6.4 Miller Creek Buffer

The Miller Creek Buffer site has dense shrubs cover and a canopy of immature trees but has approximately 10 combined acres of English ivy cover (see Figure 3). Ivy was generally found growing at ground level on the upland banks of Miller Creek, at slightly higher elevations, as well as growing up numerous tree trunks. Occasional small patches of blackberry monocultures occurred throughout the site, with some large patches occurring at the southern end of the site for a combined total of 2 acres. Other invasives noted on site include – Portuguese laurel, cherry laurel, and tansy ragwort.

Ivy and blackberry, as well as the other invasives noted on site, should be controlled using the methods described in Table 2.

The large patches of blackberry, once removed, would offer some sites where additional tree planting could occur, but follow up maintenance/treatment would be needed to ensure that blackberry does not recolonize the area.

Volunteer crews could be helpful in areas where ivy patches are easily accessible since ivy is thornless and relatively easy to manually remove. This could offer an opportunity for community engagement. Steep sections with ivy should be handled by crews experienced with steep slopes and may not be suitable for volunteers.

The high-value tree inventory performed at MU 14 shows 303 high value trees (see Appendix B).

Table 6 provides a summary of the issues, maintenance actions, and ROM costs identified for Miller Creek Buffer based on the 2023 monitoring. The summary applies the Port-wide maintenance actions identified in Table 2 to the field collected data, specifically the delineated areas of invasive species and location of fence repair.

Table 6: Maintenance Actions Identified at Miller Creek Buffer

Issue	Maintenance Action	ROM Cost
• Presence of Himalayan blackberry, English ivy, Spotted jewelweed*,* Cherry laurel, Scotch broom*, and Tansy* ragwort	• Manual removal/hand pulling of all roots, root balls, and major side roots of blackberry, English ivy, spotted jewelweed, scotch broom, and tansy ragwort. • Larger plants may be pulled using a weed wrench-type tool. • Herbicide application for blackberry and cherry laurel – while avoiding spraying adjacent desirable plants. • Removal of all the vines from the lower trunk of the tree and composting on site. • If jewelweed or tansy ragwort is in flower, carefully place a bag around the entire flower head cluster to prevent the seeds from escaping, then remove the flower/seed head. Vegetative parts may be left on site to compost. Flowers/seedheads should be disposed of in trash. • Cherry laurel EZ-ject tree injection • Cherry laurel cut-stump and frilling treatment. • Cutting for older scotch broom plants that are greater than 2” in diameter and no longer green at the base. If in seed, remove and disposed of in trash.	$615,000
• Fence line repair	• Replace any sections of fencing that is no longer functional	• $36/linear foot

6.5 Auburn

Overall, the Auburn site was doing well, with high native cover and limited invasive cover. Invasives typically occurred in edge areas with more sun exposure.

The southern border had limbs from Black Cottonwood trees hanging over the fence and members of the public expressed concern about the tree limbs along this section (see Figure 4). This is the border of most concern for this issue, as there is a bike path and homes south of the site.

The pond located in the northeast corner of the site had a 50/50 mix of bulrush (*Schoenoplectus tabernaemontani*) and cattail (*Typha latifolia*) around edge of pond and was

surrounded by native willow trees. There was not a monoculture of cattail, but presence of cattail should be monitored each site visit and maintained if areal cover increases. Preferred method of removal is to cut and drown the cattail. Duckweed covered about 10% of the pond surface.

The pond located in the southeast corner of the site had a small amount of cattail, a large amount of bulrush, and was surrounded by native willow trees. Duckweed covered approximately 50% of the pond surface.

The pond located in the southwest corner of the site was muddier than the other ponds, had no cattail or bullrush, and was surrounded by native willow trees. No duckweed was present on the surface of this pond.

Bullfrogs were noted on site, which may inhibit the abundance of native amphibians.

Aside from jewelweed control within the site and blackberry control along the edges, this site mostly needs ongoing, routine maintenance to ensure that current invasive populations are controlled and additional invasives don't establish.

There were five fence issues observed at the site, either holes in the fence or other maintenance/access issues. See Figure 4 for Fence Line Repair locations.

Table 7 provides a summary of the issues, maintenance actions, and ROM costs identified for Auburn based on the 2023 monitoring. The summary applies the Port-wide maintenance actions identified in Table 2 to the field collected data, specifically the delineated areas of invasive species and location of fence repair.

Table 7: Maintenance Actions Identified at Auburn

Issue	Maintenance Action	ROM Cost
• Presence of Himalayan blackberry, Canada Thistle, English ivy, Spotted jewelweed, and Reed canary grass	• Manual removal/hand pulling of all roots, root balls, and major side roots of blackberry, Canada thistle, English ivy, and spotted jewelweed. • Herbicide application for blackberry and Canada thistle – while avoiding spraying adjacent desirable plants. • Removal of all the vines from the lower trunk of the tree and composting on site. • If jewelweed is in flower, carefully place a bag around the entire flower head cluster to prevent the seeds from escaping, then remove the flower/seed head. Vegetative parts may be left on site to compost. Flowers/seedheads should be disposed of in trash. • Plant shrubs/trees in areas with RCG.	$68,000
• Fence line repair	• Repair holes in fences and add padlocks to fence openings that do not have secure access.	• Repair hole: $36/each

Issue	Maintenance Action	ROM Cost
	• Replace any sections of fencing that is no longer functional	• Add padlock: $30/each • $36/linear foot

References

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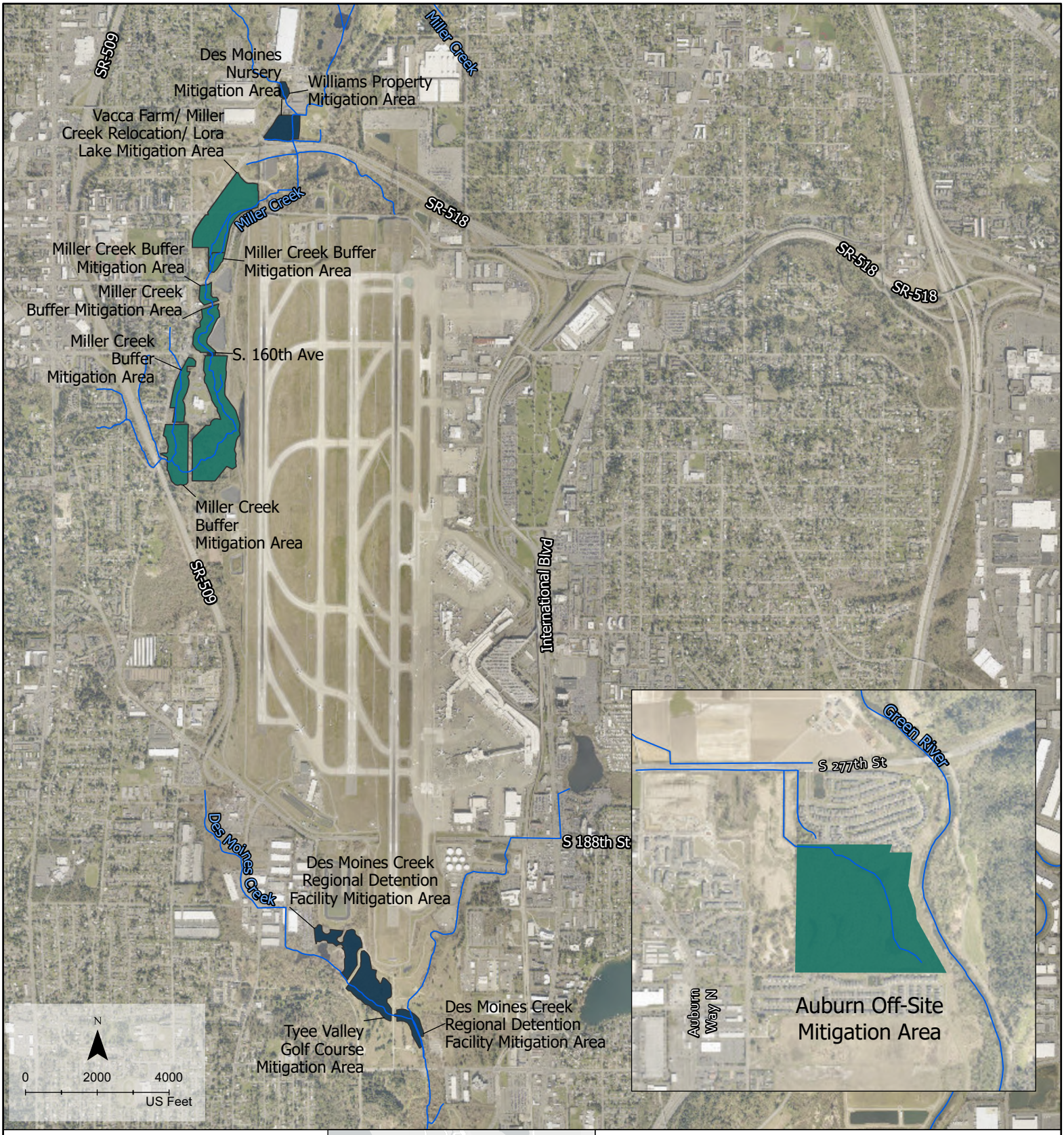
King County DNRP. 2023. Best Management Practices (BMP's) "Noxious Weed Control in King County. URL: https://kingcounty.gov/en/legacy/services/environment/animals-and-plants/noxious-weeds/weed-control-practices/bmp

Port 2019. Adapted and Revised Stream & Wetland Mitigation Monitoring Plan. U.S. Department of the Army Permit #1996-4-02325 (Amended-2). Prepared by Port of Seattle, Port of Seattle, Aviation Division. July 2019.

Washington State Noxious Weed Board. 2023. Noxious Weeds Index. URL: https://www.nwcb.wa.gov/classes-of-noxious-weeds

Figures



3rd Runway Mitigation Sites: Land Stewardship Program

Vicinity Map

Clearway Environmental

Figure 1

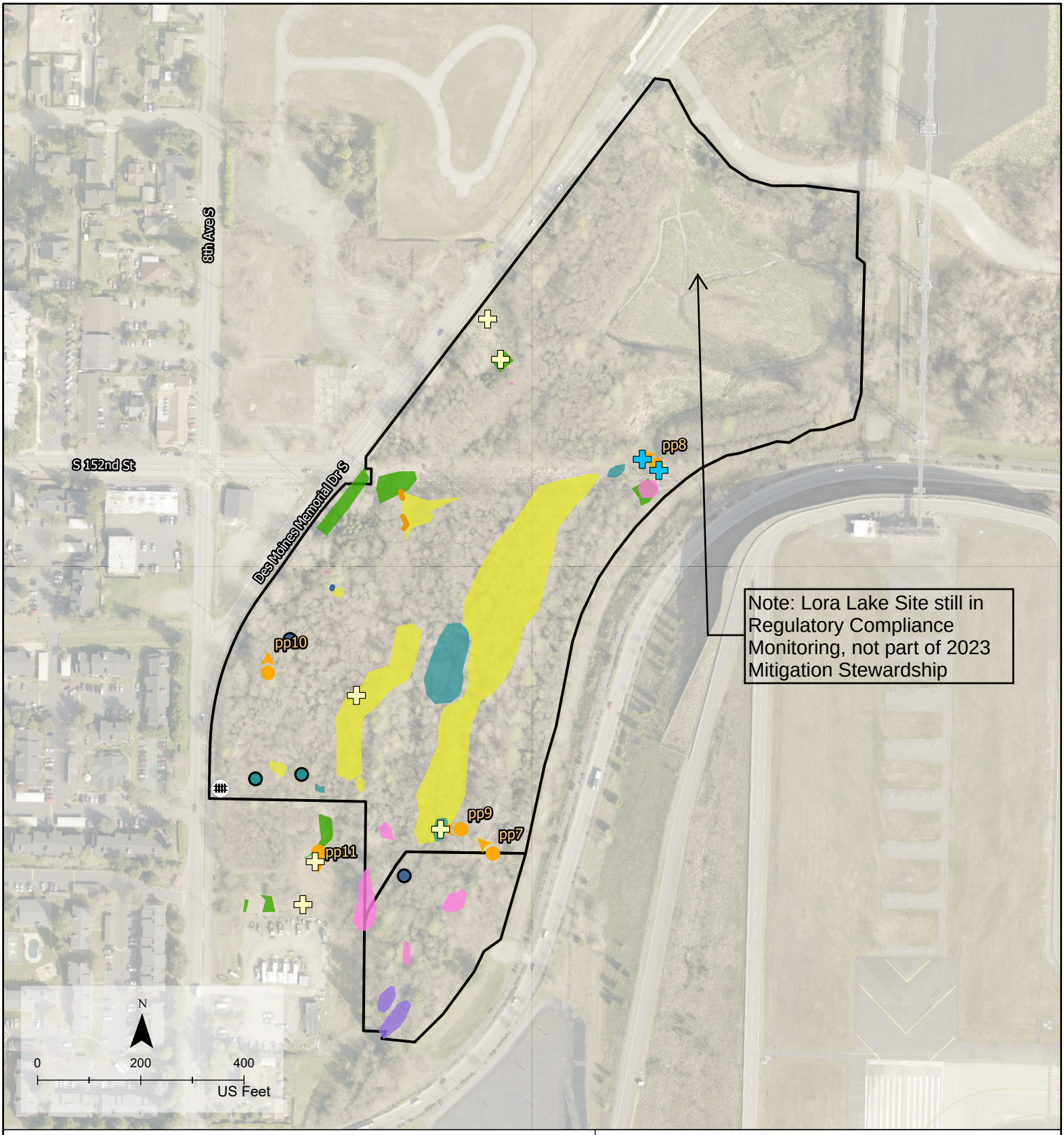


Photo point with direction taken
Fence Line Repair
BeaverDam
Possible Replanting Area
Ivy
Reed Canary Grass
Ivy
Jewelweed
Blackberry
Ivy
Jewelweed
Reed Canary Grass
Vinca
Mitigation Restrictive Covenant Boundary

3rd Runway Mitigation Sites: Land Stewardship Program

Vacca Farm/Miller Creek Relocation

Clearway Environmental

Figure 2

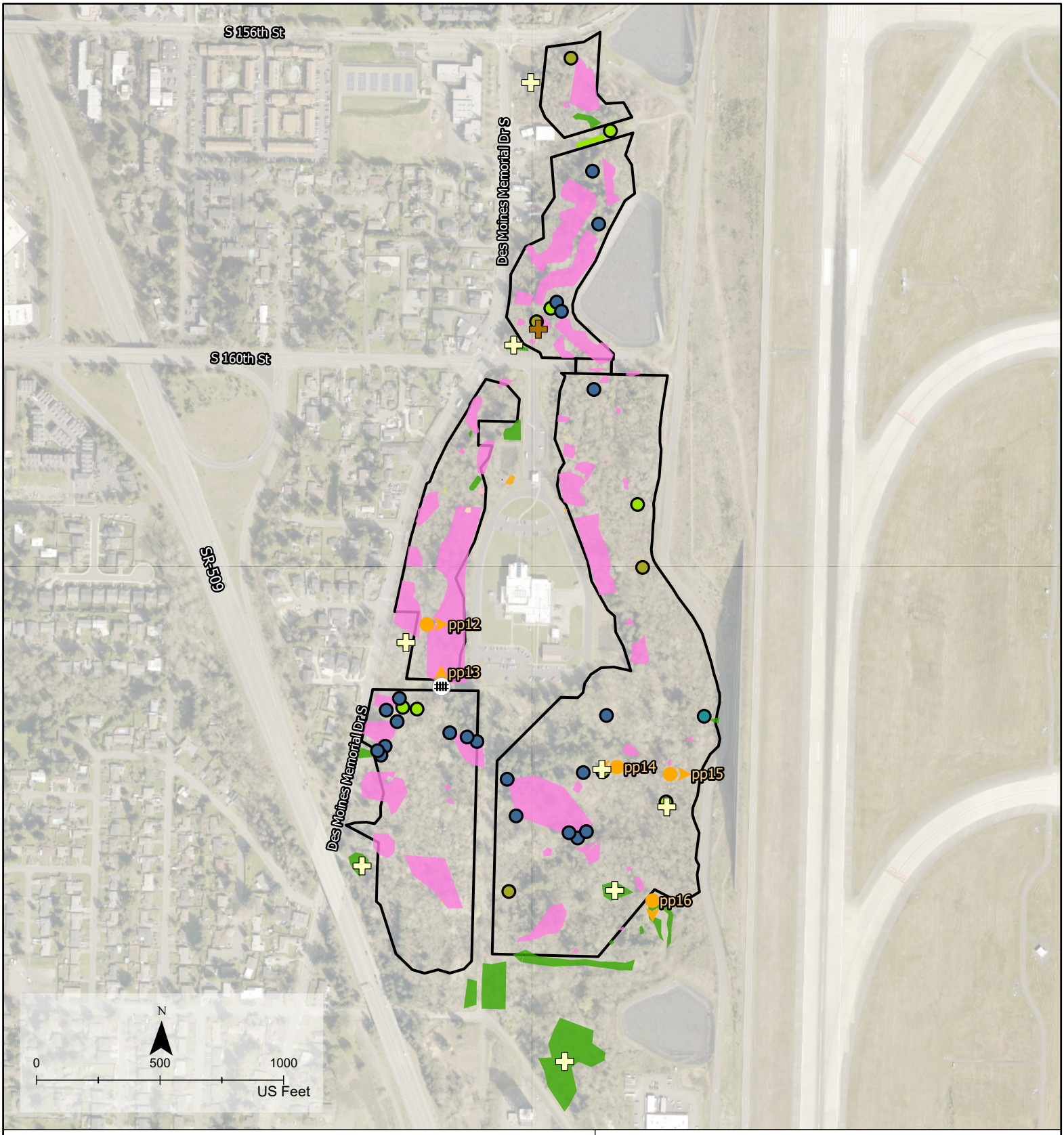


Photo point with direction taken
Fence Line Repair
Large hole
Possible Replanting Area
Blackberry
Ivy

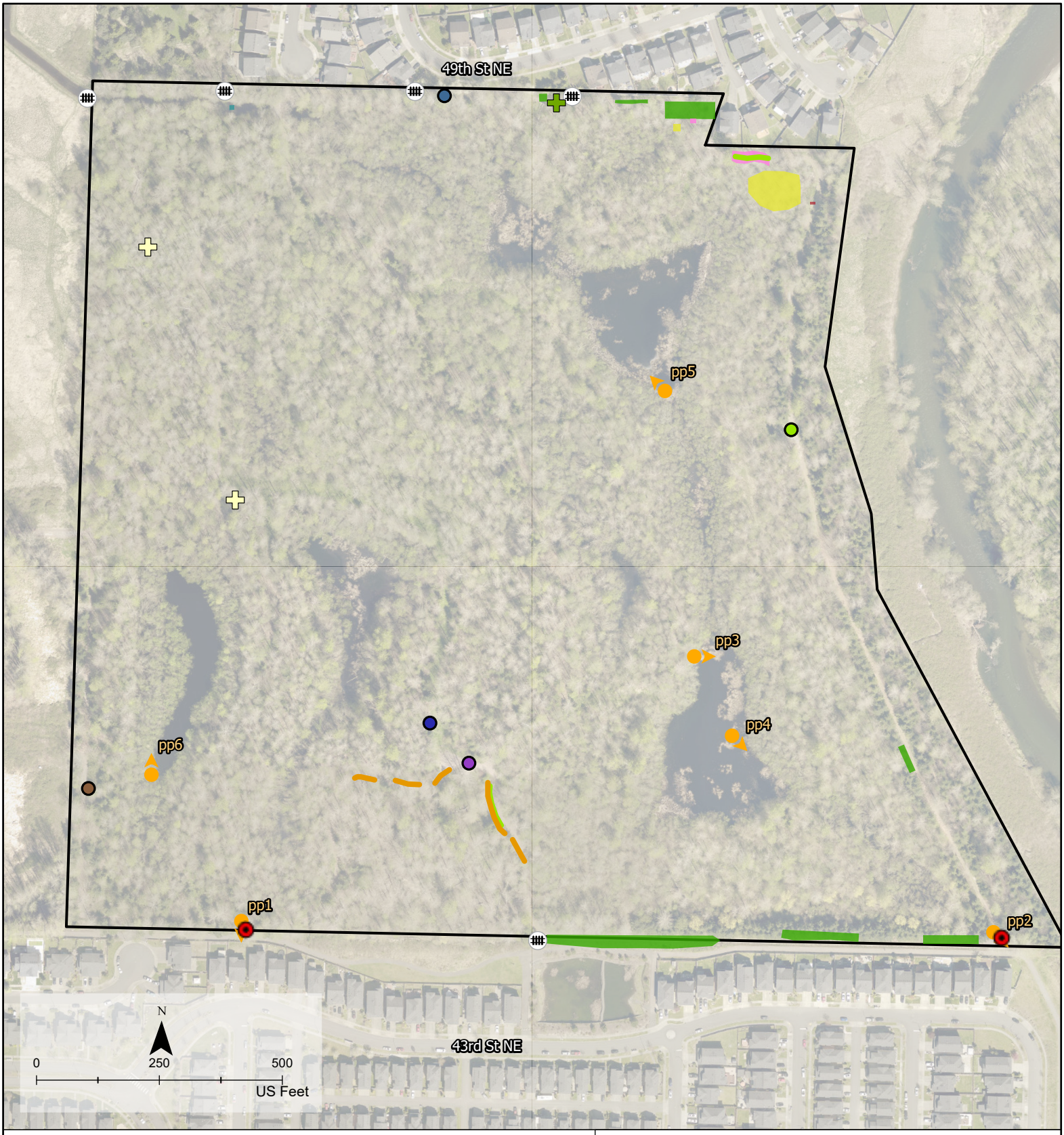
Jewelweed
Reed Canary Grass
Blackberry
Laurel
Locus
Blackberry
Ivy

Jewelweed
Tansy Ragwort
Laurel
Scotch Broom
Mitigation Restrictive Covenant Boundary

3rd Runway Mitigation Sites: Land Stewardship Program
Miller Creek Buffer

Clearway Environmental

Figure 3



- Photo point with direction taken
- Fence Line Repair
- Possible Replanting Area
- Yard waste
- Hazard Tree
- Blackberry
- Butterfly Bush
- Ivy
- Poison Hemlock
- Tansy Ragwort
- Blackberry
- Jewelweed
- Blackberry
- Canada Thistle
- Ivy
- Jewelweed
- Reed Canary Grass
- Mitigation Restrictive Covenant Boundary

3rd Runway Mitigation Sites: Land Stewardship Program

Auburn Off-Site Mitigation Area

Clearway Environmental

Figure 4

Appendix A:

Selected Photos

Photo 1: Auburn Site - trees leaning south over fence, towards private homes.

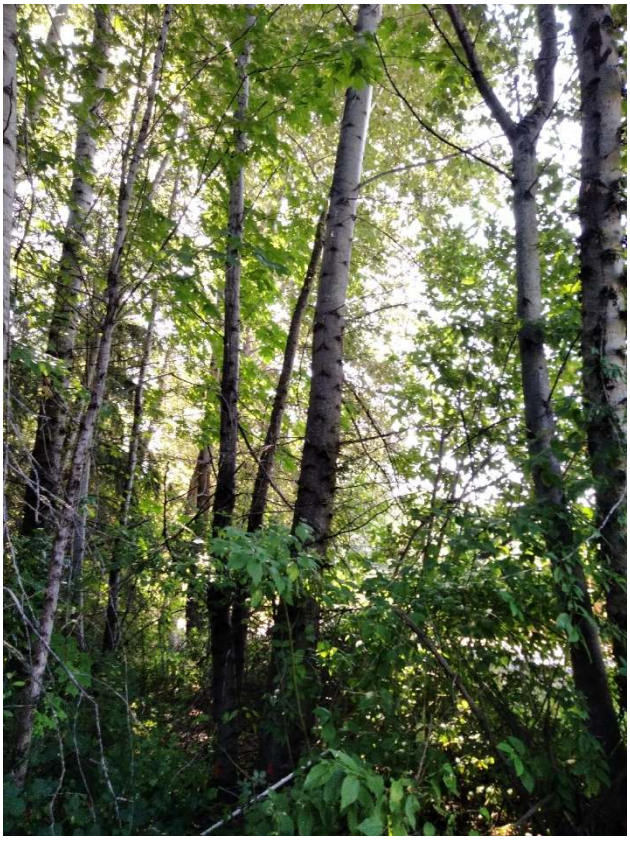


Photo 2: Auburn Site - trees leaning southeast over fence, towards private homes.

Photo 3: Auburn Site – southeast pond, shown from its northern end, mix of bullrush and cattail.

Photo 4: Auburn Site – northeast pond, shown from eastern bank looking south, mix of bullrush and cattail.

Photo 5: Auburn Site – northeast pond, shown from its southern end, mix of bullrush and cattail.

Photo 6: Auburn Site – southwest pond, shown from southern end, no bullrush or cattail, dominated by willow species.

Photo 7: Vacca Farm – Old beaver dam at southeast end of site. Water still flowing through.

Photos 8a & 8b: Vacca Farm – Large beaver dam on Miller Creek, at northern end of site. Water ponding on north side of dam (Lora Lake site).

Photo 9: Vacca Farm – Area of jewelweed growth, possible area for replanting once jewelweed is removed.

Photo 10: Vacca Farm – Example of ivy growth on tree trunks.

Photo 11: Vacca Farm – Area for possible replanting at southern end of site.

Photo 12: Vacca Farm – Example of ivy grown on upper banks of Miller Creek Buffer, on west side of site.

Photo 13: Miller Creek Buffer – Fence line maintenance noted, large tree laying on fence.

Photo 14: Miller Creek Buffer – Presence of yellow flag iris, recommend removal.

Photo 15: Miller Creek Buffer – Presence of yellow arch angel, recommend removal.

Photo 16: Miller Creek Buffer – Bare ground visible in aerial in background of photo, surrounded by blackberry in foreground.

Appendix B:

2023 High-Value Tree Inventory Memorandum

1201 3rd Avenue, Suite 2600
Seattle, Washington 98101
206.287.9130

ANCHOR QEA

Memorandum

October 13, 2023

To: Chipper Maney and Risa Askerooth, Port of Seattle

From: Anna Spooner, Anchor QEA, LLC

cc: Ann Costanza and Rachel Andersen, Anchor QEA, LLC

Re: High-Value Tree Inventory: Management Units 13, 14, 16, 17, 40, 42, and 45

Introduction

In February 2023, Treelines Forestry (Treelines) conducted a tree inventory on Port of Seattle (Port)-owned land on the west side of Seattle Tacoma International Airport (SEA). The tree inventory area includes existing mitigation areas and adjacent upland areas. The total acreage of the planned inventory is approximately 176 acres and the survey covered seven Land Stewardship Plan (LSP) management units (MUs). Table 1 lists the MUs and Figure 1 provides a map of the tree survey area

Table 1
Management Units where Trees were Surveyed

Management Unit #	Management Unit Name
13	West Side Campus
14	Miller Creek Mitigation Area
16	FAA/TRACON
17	Miller Creek/Vacca Farm/Lora Lake Mitigation Area
40	West of Airport
42	RST Property
45	West Side Campus

The survey captured high-value trees. A high-value tree is defined as a tree that is large for its species (e.g., native deciduous or coniferous trees with a diameter at breast height [DBH] at or above 30 inches) or a tree with unique historical, ecological, or aesthetic significance. Designation as a high-value tree is somewhat subjective, and final determinations shall be made by professional arborists or foresters.

The GPS surveyed location of each high-value tree was recorded (see Attachment 1), and the high-value trees were flagged. Each tree was identified as high-value because it met one or more of the following criteria:

- Coniferous trees and big leaf maples more than 28 inches DBH.
- Trees with unique characteristics, scientific or cultural value, such as yew, madrone, oaks, black walnut, Pacific dogwood, and older apple trees. Species could also include Sequoia, redwood, other cedars, Colorado blue spruce, and other ornamental spruce.

- High-value trees do not include weeping willow or other willows, black cottonwood, cherry, plum, hazelnut, poplar, alder, birch, hawthorne, Japanese maple, or photina.

Figure 1
Tree Inventory Site Map

Treelines recorded the following information for each tree, along with any other notable features:

- Species
- Height
- DBH
- Dead/alive status
- Presence/absence of invasive species such as ivy
- Other notable features, forking, leaning, wounds, presence of disease/debris, etc.

This memorandum summarizes the data collected and provides a species description of all high-value tree species identified. The species information was researched with multiple sources; all are listed in the references section.

Summary of Collected Data

During the fieldwork, 408 high-value trees were surveyed. Nearly 270 of the surveyed trees have a DBH of 30 inches or greater. 80% of the surveyed trees are coniferous and deciduous tree species native to the Pacific Northwest. Table 2 provides an overview of the collected data. Refer to Attachment 2 for full data results. Note that in some instances, the details of a tree could not be clearly measured or recorded due to excessive invasive blackberry brush, and an estimate was made (see Attachment 2).

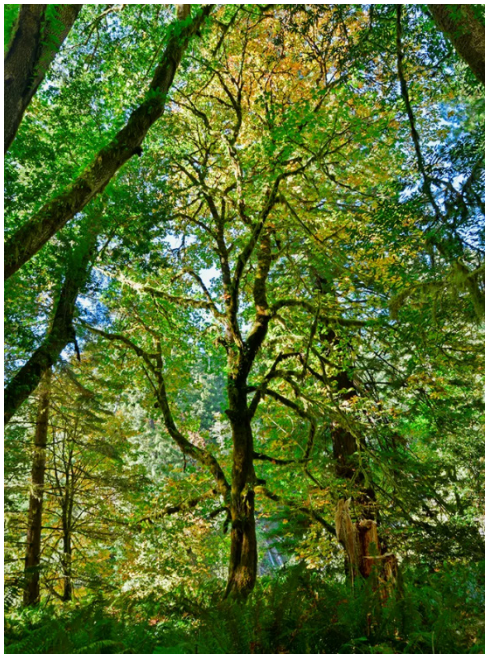
Table 2
High-Value Trees Data Summary

Data	Quantity
Total high-value trees surveyed	408
High-value trees with DBH at or above 30 inches	269
High-value trees with unique historical, ecological, or aesthetic significance	139
Native coniferous high-value trees	288
Native deciduous high-value trees	45
Non-native/ornamental high-value trees	75
High-value trees on MU 13	31
High-value trees on MU 14	303
High-value trees on MU 16	12
High-value trees on MU 17	6
High-value trees on MU 40	5
High-value trees on MU 42	1
High-value trees on MU 45	45
High-value trees outside of MUs	5
High-value trees with invasive species present	183

High-Value Trees: Species Descriptions

Native Species

The following native tree species were found on the site:



https://www.nps.gov/articles/000/bigleaf-maple.htm

http://nativeplantspnw.com/big-leaf-maple-acer-macrophyllum/

Bigleaf Maple

Acer macrophyllum, also known as bigleaf maple, is a large, upright, deciduous tree native to western North America, mainly along the Pacific coast from the southernmost part of Alaska to southern California. It is known to be a fast-growing, long-lived tree that can reach up to 100 feet tall but is most often 50 to 60 feet tall and 65 feet wide. The trunk can grow up to 40 inches in diameter. Bigleaf maples are deciduous trees that lose their leaves in the winter but provide vibrant fall color in cold regions. The leaves are palmate, typical of maples, but much larger than the leaves of other maple species, reaching up to a foot across. The flowers of bigleaf maples are abundant in early spring, hanging in bunches of greenish yellow before the leaves begin to emerge. These trees are most abundant along streambanks and canyons, where an abundance of moisture can be found, or adjacent to grassland, woodland, or pine forests. In addition, a wide variety of other species of plants, mosses, ferns, and lichens grow from the trunk and branches of this maple, contributing to the organic matter that litters the forest floor and provides nutrients and moisture for other species.

Treelines recorded approximately 50 bigleaf maple trees within the survey area. Many had invasive English ivy (*Hedera helix*) growing up the trunk to heights of 40 feet and old tags from a previous survey. The bigleaf maples surveyed ranged in size from 28 to 49 inches DBH and heights of 49 to 113 feet tall.

https://conifersociety.org/conifers/pseudotsuga/

https://treesandshrubsonline.org/articles/pseudotsuga/pseudotsuga-menziesii/

https://www.wnps.org/native-plant-directory/208:pseudotsuga-menziesii

Douglas Fir

Pseudotsuga menziesii, or Douglas fir, is a long-lived evergreen conifer species in the pine family. Their native range is from Southwestern British Columbia to central Mexico. As the largest and tallest member of the pine family, they can grow up to 295 feet tall and 12 to 20 feet wide with a DBH of up to 6 feet in old-growth forests. These trees grow on both sides of the Cascade Mountains and along the coast and are known for their rugged, thick bark, which is good at withstanding forest fires. The Douglas fir needles are tiny, yellow- or blue-green, with white stripes, while the cones are small and yellow-reddish for the males and larger (2 to 4 inches) reddish-brown and hanging for females.

Douglas fir is one of the most widespread of all western trees, growing anywhere but in the wettest of conditions. Because of their resilience and strength, they can regenerate quickly after significant major disturbances, making them essential economically as a timber product. This species also has great cultural significance to many local tribes because it has been used for medicinal purposes, as fuel for fires, and for tools such as fishing hooks, spears, and handles.

Treelines recorded approximately 108 Douglas fir trees in the survey area. Many had English ivy (*Hedera helix*) growing up the trunk to heights of 10 to 60 feet and old tags from a previous survey. The trees recorded ranged in size from 28 to 44 inches DBH and heights of 61 to 158 feet tall.

https://treesandshrubsonline.org/articles/abies/abies-grandis/

Grand Fir

Abies grandis, also known as grand fir, is a fast-growing and hardy fir native to the Pacific Northwest and northern California and grows at altitudes between sea level and 5,600 feet. As one of the world's tallest trees, and the largest of the *Abies* genus, they can grow up to 270 feet with widths of 25 feet and DBH of up to 62 inches. They have soft, dark green, fragrant needles with silver undersides and surprisingly small cones that sit upright on the branches.

Grand firs grow best in floodplains, where they are successful at competing against other trees such as Douglas firs, western red cedar, and western hemlock. Foresters dislike this species because it is so successful at multiplying and quickly crowding out more valuable pine and larch species. These thin-barked trees are also known for being susceptible to low-intensity fires, soft, weak, and prone to decay and infestation by beetles.

Grand firs, along with Douglas firs and noble firs, are a favorite for Christmas trees because of their shiny needles, symmetry, and desirable scent. For this reason, they are often used in urban plantings and recreation areas as well. They also have historical significance because early settlers depended upon them as tie-offs to control the rate of descent as covered wagons conversed particularly steep slopes.

Treelines recorded just one grand fir on the surveyed land, measuring 36 inches DBH and 90 feet tall.

https://treesandshrubsonline.org/articles/abies/abies-procera/

Noble Fir

Abies procera or noble fir is one of the largest firs in the *Abies* genus. It can be found in the Cascade Range and Coast Ranges of the Pacific Northwest at elevations between 300 and 5,000 feet. Noble firs can grow to 230 feet tall and 30 feet wide with a DBH of 45 to 60 inches. They are long-lived, up to 600 to 700 years, but more typically around 400 years, and fast-growing. This species is tall and narrow, with a columnar trunk, rounded crown, and short, almost horizontal branches; the bluish-green striped needles are stiff and grow upward, exposing the underside of the branches. The cones are large and erect on the branches and ripen from purple to green to brown. The pollen cones are small and magenta-colored.

The stiff branches, symmetry, and ability to hold onto its needles after being cut make the noble fir a favorite for Christmas trees. Historically, this species was also used for building airplanes and ladders because of its slight weight. It is also considered one of the best firs for lumber because of its clear, light grain and strength.

Treelines recorded just one noble fir in the survey area, measuring 36 inches DBH and 57 feet tall.

https://xeraplants.com/plants/arbutus-menziesii/

https://nativefoodsnursery.com/pacific-madrone/

https://www.portlandnursery.com/natives/arbutus

Pacific Madrone

Arbutus menziesii, also known as the Pacific madrone, is a broadleaf evergreen tree in the Ericaceae family and the largest blooming tree in this family. It is native to the western coast of North America, from British Columbia to California. It is most often found along coastal cliffs and hillsides. The Pacific madrone grows up to 80 to 125 feet tall with a DBH of 24 to 48 inches and a spread of up to 50 feet. They are long-lived, up to 400 years, but slow growing.

The Pacific madrone is known for its elegant, wide-branching, twisting structure and striking red bark, which peels to expose a smooth, green underside. It produces fragrant white flowers in clusters and edible red fruits, which can be used for cider, fishing bait, or medicinal tea.

The significance of this species is due to its cultural and ecological value. Historically, Indigenous communities gathered and dried the berries for steelhead fishing while using the bark and leaves for medicinal tea to treat colds and stomach issues. It is also a vital food source for many bird species because its berries mature late in the summer and last long into the winter. In addition, its salt tolerance allows it to grow where many other species of trees cannot.

Treelines recorded approximately 55 Pacific madrone trees in the survey area. Many were multi-trunked with heavy ivy growth up to 10 to 30 feet, leaning or plagued with an undetermined disease. In addition, old tags from a previous survey were found on several trees. The trees recorded ranged in size from 8 to 30 inches DBH and heights of 25 to 78 feet tall.

https://www.laspilitas.com/nature-of-california/plants/513--pinus-ponderosa

https://www.gardenia.net/plant/pinus-ponderosa

Ponderosa Pine

Pinus ponderosa, or the ponderosa pine, is found throughout much of the western United States, from British Columbia and Alberta in Canada to Mexico. It typically grows in dry, open forests and can be found from sea level to over 9,000 feet but usually between 3,300 to 7,000 feet above sea level.

The ponderosa pine is characterized by a tall, straight trunk and 5- to 10-inch long, yellow-green needles arranged in clusters of three. The tree bark is thick and deeply furrowed and reddish-brown to black-colored. The cones of ponderosa pine are 3 to 6 inches long and egg-shaped.

Ponderosa pine is important culturally and ecologically. Some Indigenous people consider it a sacred tree, which has been used in traditional medicine and ceremonies. It is also an important timber species and has significant value as wildlife habitat, erosion control, and in recreational settings.

Treelines recorded four ponderosa pine trees in the survey area, all with diameters of approximately 30 inches and heights of around 60 to 112 feet, with half of the trees forking at 12 feet above the ground.

https://www.conifers.org/ta/Taxus_brevifolia.php

https://www.conifers.org/ta/Taxus_brevifolia.php

Pacific Yew

Taxus brevifolia, also known as the Pacific yew, is a slow-growing evergreen tree that typically grows to a height of 30 to 50 feet tall with a DBH of 12 to 24 inches. It grows in the Pacific Northwest, including the coastal areas of Washington, Oregon, and northern California, in moist, shady environments. Pacific yews are often found in the understory of old-growth forests at elevations ranging from sea level to 6,000 feet.

The Pacific yew's distinctive appearance makes it stand out against other species. It has short, flat, dark green needles arranged in a spiral pattern around the stem and small, bright red fruit that is not edible. The bark is reddish-brown and covered with stringy fibers.

Pacific yew is historically significant and has been used by Indigenous people in the Pacific Northwest for centuries for medicinal purposes, including the treatment of cancer, arthritis, and other ailments. In addition, in some tribes, it is considered a symbol of strength and resilience.

Treelines recorded one Pacific yew tree in the survey area, with a DBH of 15 inches and approximately 30 feet tall.

https://treesandshrubsonline.org/articles/thuja/thuja-plicata/

https://davisla.wordpress.com/2011/10/08/plant-of-the-week-thuja-plicata/

Western Red Cedar

Thuja plicata, or western red cedar, is an evergreen coniferous tree that can grow up to 200 feet tall, with a DBH of up to 13 feet. It is native to the Pacific Northwest, along the coast, from Oregon to British Columbia. It grows in moist forests at elevations from sea level to 6,500 feet.

The western red cedar is known for its fragrance and reddish-brown bark that peels off in long, thin strips. It has scaly, flat leaves that are bright green and shaped like a fan. The cones are surprisingly small, at only about 1/2 inch long, and oblong.

Western red cedar has been used by both settlers and Indigenous people as a building material for homes, canoes, totem poles, and medicinal and ceremonial purposes. It is also significant for its use as a habitat for various wildlife species and its ability to stabilize soils and prevent slope erosion.

Treelines recorded approximately 145 western red cedar trees in the survey area. Each had a DBH of 28 to 54 inches and heights of 71 to 140 feet. Several had English ivy growing up the trunk to varying heights, splits, dead tops, forking, and old tags from a previous survey. Pileated woodpecker excavations were visible on two trees, while wire, chains, and debris were found embedded in several trunks.

https://florafinder.org/Species/Picea_sitchensis.php

Sitka Spruce

Picea sitchensis, also known as the Sitka spruce, is a large, evergreen coniferous tree growing up to 300 feet tall, with a DBH of up to 8 feet. It is native to the Pacific Northwest and found along the coasts of Alaska and British Columbia down to California. It grows at elevations ranging from sea level to 3,500 feet.

The Sitka spruce has horizontal branches that droop slightly at the tips and an overall conical shape. The needles are blue-green, and the bark is thin and grayish brown, with small, flaky scales. The tree also produces small, cylindrical-shaped cones that are about 3 to 4 inches long. The Sitka spruce has significance culturally and ecologically in the Pacific Northwest. Local Indigenous people have used it for building materials and canoe construction. It also provides habitat for a number of species.

Treelines recorded one Sitka spruce tree in the survey area. It had a DBH of 29 inches and a height of 135 feet.

https://landscapeplants.oregonstate.edu/plants/tsuga-heterophylla

https://www.wnps.org/native-plant-directory/327:tsuga-heterophylla

Western Hemlock

Tsuga heterophylla, or western hemlock, is the largest species of hemlock and the official state tree of Washington because of its role in our forest industry. It is a large, shade-loving conifer that grows to between 90 and 200 feet tall, with a DBH of up to 9 feet. It can be found at elevations up to 6,500 feet along the Pacific Northwest, from Alaska to California, in moist forests, often under the canopy of other larger trees.

The western hemlock tree has a narrow, conical shape with a straight trunk and a dense crown of branches. The bark is thin, scaly, and gray-brown, and the needles are short and flat, with two white stripes on the underside. The cones are about an inch long and light brown in color.

Western hemlock has significance in the Pacific Northwest due to its ecological value to deer and elk, which use it as a food source. It also provides habitat for many other species, has aesthetic value to many national parks in the United States, and prevents erosion on hillsides and streambanks.

Treelines recorded seven western hemlock trees in the survey area. All had a DBH between 29 and 38 inches and heights of 73 to 136 feet. Most were plagued with heavy English ivy growing up their trunks, broken trunks or leaning, snags, and old tags from a previous survey.

https://www.inaturalist.org/guide_taxa/577817

http://nativeplantspnw.com/western-white-pine-pinus-monticola/

http://nwconifers.com/nwhi/wwhitepine.htm

Western White Pine

Pinus monticola, also known as the western white pine, is a fast-growing, large conifer native to the Pacific Northwest and the Rocky Mountains between 3,000 and 5,000 feet above sea level. It can grow to 200 feet tall, with a DBH of up to 78 inches. It is considered "near threatened" because of its decreasing numbers.

The western white pine has a straight trunk, sparse crown of branches, and an overall conical shape. The bluish-green needles are long, slender, and arranged in bundles of five, and the gray-brown bark is smooth and breaks into large rectangular plates. The cones are large, sticky, and banana-shaped.

Western white pine has not been used as much as other pines for timber, but it is light, attractive, and often used to make wooden matches. It is also easy to work with, making it an ideal wood for carving and building materials. Because of its tolerance for poor site conditions, and lack of pests and diseases, it is valuable economically and for restoration programs. Indigenous people would historically use the resin to seal canoes and eat the inner bark when other food sources were scarce.

Treelines recorded two western white pine trees in the survey area, both with a DBH of 30 inches and heights of 85 feet tall.

Non-Native Species

The following non-native species were also found and recorded:

https://organicplantcarellc.com/chinese-chestnut-castanea-mollissima/

https://kb.jniplants.com/american-chestnut-castanea-dentata/

Common Chestnut

Castanea dentata, or common chestnut, is a large deciduous tree that can grow up to 100 feet tall. It has a straight trunk and a rounded crown with deeply furrowed bark. The leaves are long and slender with serrated edges and a glossy dark green color, turning yellow or brown in the fall. The tree produces large, spiny burs that contain two to three edible nuts.

The chestnut tree is not native to the Pacific Northwest. Still, it has cultural significance as a symbol of the lost chestnut forests of the eastern United States, which almost died off in the early 20th century due to a fungal disease that killed over 4 billion trees. The tree was an important part of the culture and economy of the eastern United States, significantly impacting the landscape and communities that relied on it. The nuts are a staple food for wildlife and were once an important food source for humans. The wood of the American chestnut was also highly valued for its strength and durability, making it a popular choice for furniture and construction.

Treelines recorded approximately six chestnut trees in the survey area. All had a DBH of 15 to 20 inches and heights of 61 to 82 feet.

https://wnmu.edu/academic/nspages/gilaflora/malus_domestica.html

https://plantsam.com/malus-domestica/

Apple

Malus domestica, also known as the domestic apple, is a small deciduous fruit tree that belongs to the Rosaceae family. It can grow up to 30 feet tall and has a broad, spreading crown with an equally large spread of up to 25 to 30 feet. The leaves of the apple tree are oval-shaped and have a serrated edge. They are usually dark green in color and turn yellow in the fall. The flowers are white or pink in the spring and attract pollinators, leading to fruit in the late summer or fall. The fruit can vary in color from green to yellow to red, depending on the variety.

Humans have farmed apple trees for thousands of years. Washington is the country's top apple-producing state, and the region's apple-growing heritage is celebrated yearly in the form of festivals and other events. Apples are often included in favorite local dishes and beverages, such as apple pie, apple cider, and hard cider. The apple tree plays a significant role in shaping the cultural identity of many people from the Pacific Northwest. Heritage apples are the trees grown by our great, great grandparents. These varieties were used to make Halloween treats; dried; used in baking; made into brandy, cider, and vinegar; and fed to livestock. Unfortunately, few of these trees remain today.

Treelines recorded approximately eight apple trees in the survey area. All had a DBH in the range of 8 to 19 inches and heights of 20 to 42 feet. Two trees forked at the ground and apples were scattered around the trees.

https://sactree.org/trees/deodar-cedar/

https://treespnw.forestry.oregonstate.edu/conifer_genera/true_cedar.html

True Cedar

Cedrus, or true cedar, is an evergreen coniferous tree native to the Pacific Northwest region of North America, including Seattle. It is a tall tree that can grow up to 225 feet and has a DBH of up to 78 inches. It has a round crown, and the bark is thin, reddish-brown, and fibrous, with a distinctive, strong scent. The leaves are scale-like and overlap in four rows, forming flattened sprays. The cones are small, brown, and oblong.

True cedar has significant cultural and ecological significance in the Pacific Northwest. It has been traditionally used by Native American tribes for a variety of purposes, giving them much of what they needed for life, including canoes, totem poles, baskets, clothing, and other items of cultural and practical significance. It was also used to build shelters and tools. The tree is also an important part of the local ecosystem, providing habitat and food for various wildlife.

The true cedar is also used for aesthetic purposes and landscaping because of its ease of care and ability to thrive in many soils and site conditions. Its attractive foliage, form, and pleasant scent make it a popular choice for hedges, windbreaks, and privacy screens. It is also often used for outdoor furniture and decking because of its durability and resistance to decay. Efforts are being made in the Pacific Northwest to preserve this tree even while commercial logging threatens it.

Treelines recorded three true cedar trees in the survey area. They all had a DBH of 28 to 47 inches and heights ranging from 76 to 80 feet.

https://plants.ces.ncsu.edu/plants/robinia-pseudoacacia/

https://www.inaturalist.org/taxa/56088-Robinia-pseudoacacia

Black Locust

Robinia pseudoacacia, commonly known as black locust, is a fast-growing deciduous tree reaching 80 feet and a DBH of 3 feet. Black locust is considered an invasive species in the Pacific Northwest, where it rapidly spreads and suppresses the growth of native vegetation, especially in disturbed areas.

The bark is dark gray and deeply furrowed, while the leaves are pinnately compound with five to seven oval leaflets and are dark green. The tree produces fragrant, white flowers in late spring or early summer, which are a source of nectar for bees and other pollinators. They turn into flat, brown seed pods in late summer.

Despite its invasive status, the wood of the black locust is strong, durable, and resistant to decay, making it a valuable resource for fence posts, railroad ties, and other construction uses. The tree is also often used as an ornamental species in urban and suburban landscapes because of its attractive foliage and showy flowers. Medicinally, the flowers of the black locust have been used in traditional medicine to treat various ailments, including bronchitis, asthma, and rheumatism. However, the tree is also known to be toxic to livestock and harmful to humans.

Treelines recorded approximately 24 black locust trees in the survey area. They all had a DBH between 8 and 24 inches and heights of 42 to 71 feet. Most had ivy growing up the trunk to heights of 10 to 25 feet.

https://the-natural-web.org/tag/fagus-grandifolia/

https://www.missouriplants.com/Fagus_grandifolia_page.html

Beech

Fagus, also known as the beech tree, is a large, deciduous tree with a broad oval crown and smooth, gray bark. It can grow up to 80 feet tall and has a spread of about 50 feet. The leaves are elliptical, with pointed tips and slightly serrated edges, and turn a bright yellow in the fall before dropping off. Beech trees produce nuts in spiny husks that ripen in the fall and are a valuable food source for many animals, including squirrels and deer.

Beech trees are not native to the Pacific Northwest. Still, due to their aesthetic value, they are often planted as ornamental trees in parks and gardens and used in urban settings, including the Washington Park Arboretum. In addition, they can provide significant shade and shelter for humans and other species. They are also valued for their wood, which is used for flooring, veneers, and furniture.

Treelines recorded two beech trees in the survey area. They had a DBH of 14 and 24 inches and heights of 40 and 58 feet, respectively.

https://www.vdberk.com/trees/catalpa-speciosa/

https://gobotany.nativeplanttrust.org/species/catalpa/speciosa/

Western Catalpa

Catalpa speciosa, or western catalpa, is a large, deciduous tree native to the central and eastern United States. It can grow up to 50 to 100 feet tall, has a broad, spreading crown as wide as it is tall, and has a DBH of up to 40 inches. The tree is easily recognizable due to its exceptionally large, heart-shaped leaves and showy, bell-shaped flowers that bloom in late spring or early summer. The flowers are white with purple or yellow markings and are known to have a sweet fragrance.

Catalpa speciosa is not native to the Pacific Northwest and not often found in urban areas, but it can occasionally be found in parks and gardens.

The tree is significant in Native American cultures, but not local tribes specifically. For example, the Cherokee people used this tree to make bows and used the bark to make tea to treat coughs and snake bites. The tree has also been used throughout history to treat fevers, asthma, and malaria and is known to be a mild narcotic.

Treelines recorded one western catalpa tree in the survey area. It had a DBH of 21 inches and a height of 25 feet. It was mostly dead, with broken forks and seedpods still attached.

http://midwestnaturalist.com/acer_saccharinum.html

Silver Maple

Acer saccharinum, or silver maple, is a deciduous tree that can grow up to 50 to 115 feet tall with a spread of 35 to 50 feet and a DBH of 24 to 48 inches. It has a rounded, broad crown and branches that curve upward. Its bark is gray and smooth. The leaves have five deep lobes, with green tops and silvery undersides, which gives the silver maple its name. In the fall, the leaves turn shades of golden and pale yellow, making this species stand out against the landscape. In addition, the tree produces flowers that are small and red and clusters of winged seeds called samaras.

Silver maples are found throughout the eastern United States and Canada but are not native to the Pacific Northwest. However, they grow well in various soil types, including wet and poorly drained soil, making the Pacific Northwest coast a welcome home for them.

Locally, silver maples are popular and often planted as ornamental shade trees in urban areas and parks because of their fast growth rate and adaptability to poor soil and site conditions. They are also used for basket weaving and furniture-making. Historically, Indigenous people have also used the tree for medicinal purposes, such as treating coughs and colds.

Treelines recorded approximately ten silver maple trees in the survey area. All had a DBH of between 13 and 51 inches and a height of 53 to 90 feet. Several were multi-forked with ivy growing up the trunk.

https://plants.ces.ncsu.edu/plants/abies-nordmanniana/

Nordmann Fir

Abies nordmanniana, or Nordmann fir, is a tall and narrow coniferous tree that can reach heights up to 230 feet. They have straight trunks with a narrow, rounded crown. The needles are dark green on top and white on the bottom, and the cones are cylindrical and 4 to 6 inches long.

The Nordmann fir has cultural significance for native people in the eastern United States and has been part of folklore and history, but not specifically in the Pacific Northwest. However, it is an extremely popular ornamental tree often planted in gardens and parks for its attractive shape and color. It is also commonly used as a Christmas tree due to its ability to retain its needles after being cut and its symmetrical shape. In addition, the wood of the tree is strong and durable, making it a smart choice for furniture making and construction.

Treelines recorded one Nordmann fir tree in the survey area. It had a DBH of 30 inches and a height of 82 feet, with ivy climbing up the trunk.


https://idfg.idaho.gov/species/taxa/60675


https://idfg.idaho.gov/species/taxa/60675

Dogwood

Cornus or dogwood covers a large and diverse group of shrubs and small trees known for their colorful bark and interesting flowers. They grow in various habitats, usually in the shady understory, and prefer moist soils. They are often found along streambanks or in mixed forests. The species of dogwood commonly found in the Pacific Northwest is the Pacific dogwood (*Cornus nuttallii*). Dogwoods can grow up to 20 to 30 feet but occasionally as tall as 90 feet. Their leaves are simple and turn a deep reddish-purple in the fall. The showy bracts surrounding the small, inconspicuous flowers are striking and distinctive, usually pink or white. Dogwood bark is smooth and attractive, but in some species, it peels away to show a colorful inner bark.

Dogwoods have significant cultural and ecological importance in the Pacific Northwest. The Pacific dogwood is celebrated in many Native American legends for its beauty and is also the official state flower of British Columbia. The bark has been used for medicinal purposes, and the wood is ideal for making tools. In addition, many species of birds and animals use dogwood as a habitat and food source.

Treelines recorded one dogwood tree in the survey area. It had a DBH of 12 inches and a height of 40 feet. It was multi-forked and partially uprooted.

https://www.nps.gov/seki/planyourvisit/sequoiagroves.htm

https://davisla.wordpress.com/2011/09/03/plant-of-the-week-sequoiadendron-giganteum/

Giant Sequoia

Sequoiadendron giganteum is known as the giant sequoia or Sierra redwood. They are native to the western slopes of the Sierra Nevada mountain range in California, at elevations between 4,500 and 8,000 feet. The sequoia is a massive, columnar, medium-growing tree species that can reach heights of 60 to 275 feet, with a spread of 25 to 35 feet, and can live for thousands of years. They are known for their enormous trunk size, with a DBH of 12 to 20 feet, but occasionally up to 40 feet in diameter. The bark of the giant sequoia is rich and reddish-brown, thick and fibrous, and stands out against the landscape. The short needles are evergreen, bluish-green, and arranged in spirals around the branches. The cones of the giant sequoia are also large, reaching up to 3 inches in length, and are covered in a waxy coating to protect the seeds from fire.

In the Pacific Northwest, sequoias are not native but are often used in landscaping to make a statement with their unique appearance and enormous size. They are hugely significant to Native American communities in California and are used as a cultural symbol in many traditional stories and practices. Environmentally, they are highly valued as habitat for various wildlife and help regulate the local climate.

Treelines recorded four sequoia trees in the survey area. They all had a DBH of between 62 and 64 inches and heights of 111 to 138 feet. Two had heavy ivy growing up the trunks.

https://plantingjustice.org/shop/natives-tree-seedlings/native-trees-shrubs-natives-tree-seedlings/port-orford-cedar-chamaecyparis-lawsoniana-organic/

Port Orford Cedar

Chamaecyparis lawsoniana, or Port Orford cedar, is a tree native to southwest Oregon and northwest California. It grows in cool, moist environments and is often found in mixed conifer forests, usually at elevations between sea level and 4,900 feet. It is a large evergreen tree that can grow up to 150 to 200 feet tall, with a DBH of 4 to 6 feet, and has a narrow, conical shape. The foliage is blue-green, and the bark is thin, scaly, and reddish-brown. It is known for its strong, pleasant smell that comes from its wood and leaves. Unfortunately, the Port Orford cedar has become popular in the timber industry, which has led to over-harvesting and loss of habitat in some areas. For this reason, it is listed as near threatened, and conservation efforts have been undertaken to protect the species and ensure its continued success.

Though the Port Orford cedar is not native to the Seattle area, it grows well here and is commonly used in ornamental landscaping. In addition, it has cultural significance to many tribes, who have long used its wood to build canoes, houses, and art, such as masks, carvings, and baskets.

Treelines recorded one Port Orford cedar tree in the survey area. It had a DBH of 34 inches and a height of 77 feet, with multiple forks at 6 feet and an old tag from a previous survey.

https://treesandshrubsonline.org/articles/taxus/taxus-canadensis/

https://trees.umn.edu/canada-yew-taxus-canadensis

Canada Yew

Taxus canadensis, or Canada yew, is a slow-growing, small evergreen tree or shrub that grows up to 4 feet tall with a spread of 7 feet, often found in swampy woods, ravines, and other shady, wet areas around much of North America. Its dark green, needle-like leaves grow in a spiral pattern around the stem. The female Canada yews produce bright, visually striking, but toxic red berries.

The Canada yew is significant to many Native American tribes for its medicinal purposes. The bark, needles, and leaves contain taxol, a chemical compound that can be used to treat certain types of cancer, fevers, and influenza. It was also used to craft bows, canoe paddles, weapons, and tools. In gardens and landscaping, it is also used as an ornamental plant because of its dark-leaved and brightly colored berries. It is also valuable as an understory species and provides a habitat for many species of birds and other animals.

Treelines recorded one Canada yew tree in the survey area. It had a DBH of 5 inches and a height of 14 feet.

https://futureforests.ie/products/picea-abies

https://www.gardenersworld.com/plants/picea-abies/

Norway Spruce

Picea abies, or Norway spruce, is a large, coniferous tree native to Europe and western Asia. It can be found in cool and moist climates, where it typically grows up to 40 to 60 feet tall with a spread of 25 to 30 feet and a DBH of 40 to 60 inches. It has a rounded crown with dark green needles and gray-brown bark that is scaly with deep furrows. The cones are long and curved and have a reddish-brown color.

In the Pacific Northwest, Norway spruce is often used as an ornamental tree in parks and gardens. It is also well-loved as a Christmas tree for its conical shape and dense foliage. In addition, Norway spruce is suitable for construction, furniture-making, and paper production. It is also significant ecologically as a habitat for various species of birds and other animals. However, because this species is not native to North America, it has little historical significance locally. Still, it has played a considerable role in the cultural history of Scandinavia and Northern Europe, where it has been used in traditional medicine, folk art, woodcarvings, and to make stringed instruments.

Treelines recorded one Norway spruce tree in the survey area. It had a DBH of 30 inches and a height of 78 feet, with a broken top.

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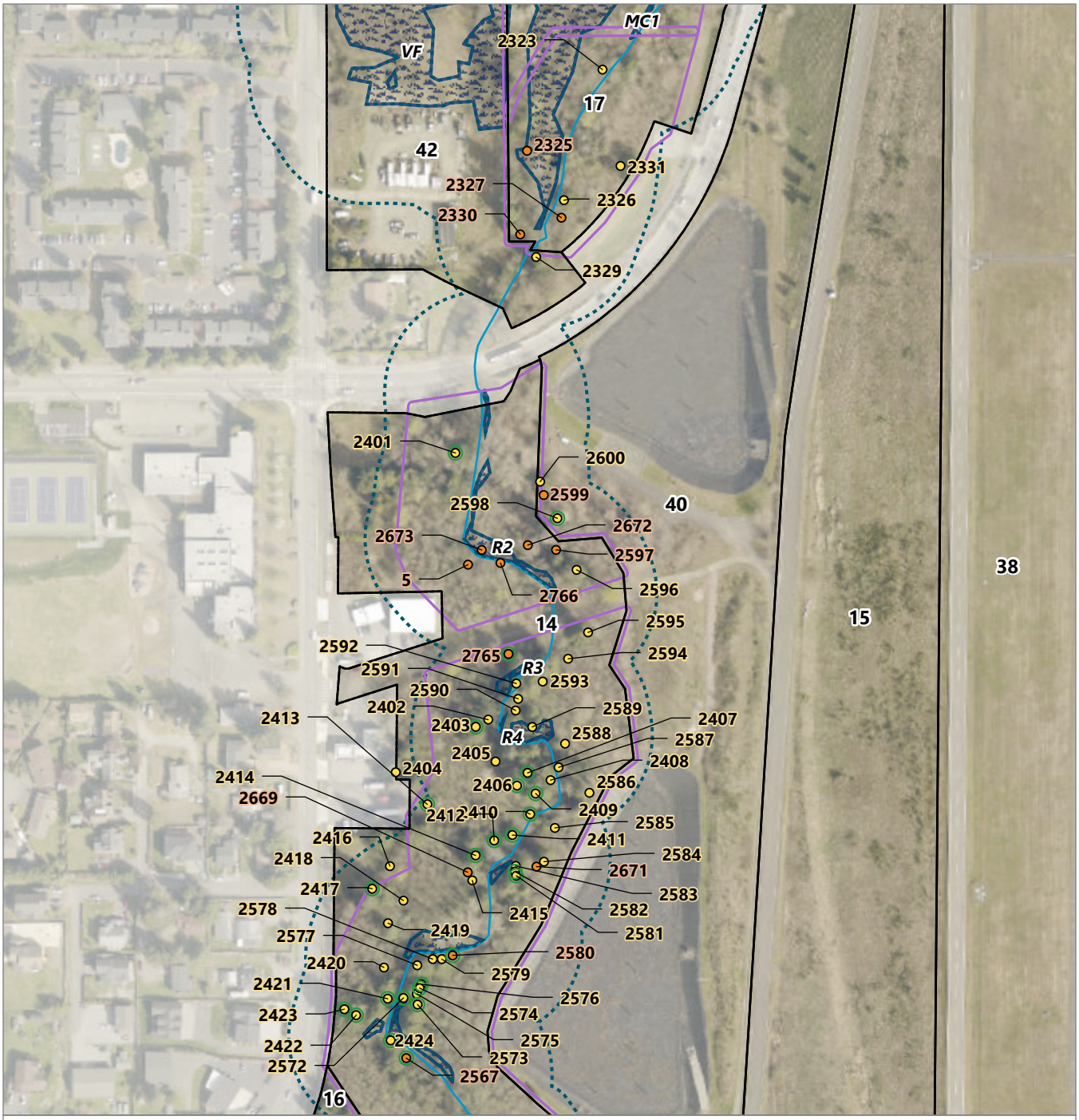
Attachment 1
High-Value Tree Surveyed Locations



LEGEND:

- Port-Owned Aviation Properties at Sea-Tac Airport
- Land Stewardship Plan Management Units
- Mitigation Restrictive Covenant
- FCSP Mitigation Site
- Stream
- Stream Buffer
- Wetland Buffer
- Wetland

Tree Inventory

- >30" DBH
- <30" DBH
- Ivy Presence

NOTES:

1. Port-Owned Aviation Properties: Port of Seattle
2. Aerial Imagery: King County (2021)
3. Airport natural resource data: Environmental Science Associates
4. Critical Areas: Des Moines, SeaTac, and Burien jurisdictions
5. Tree inventory: Treelines Forestry (2023)

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Feet

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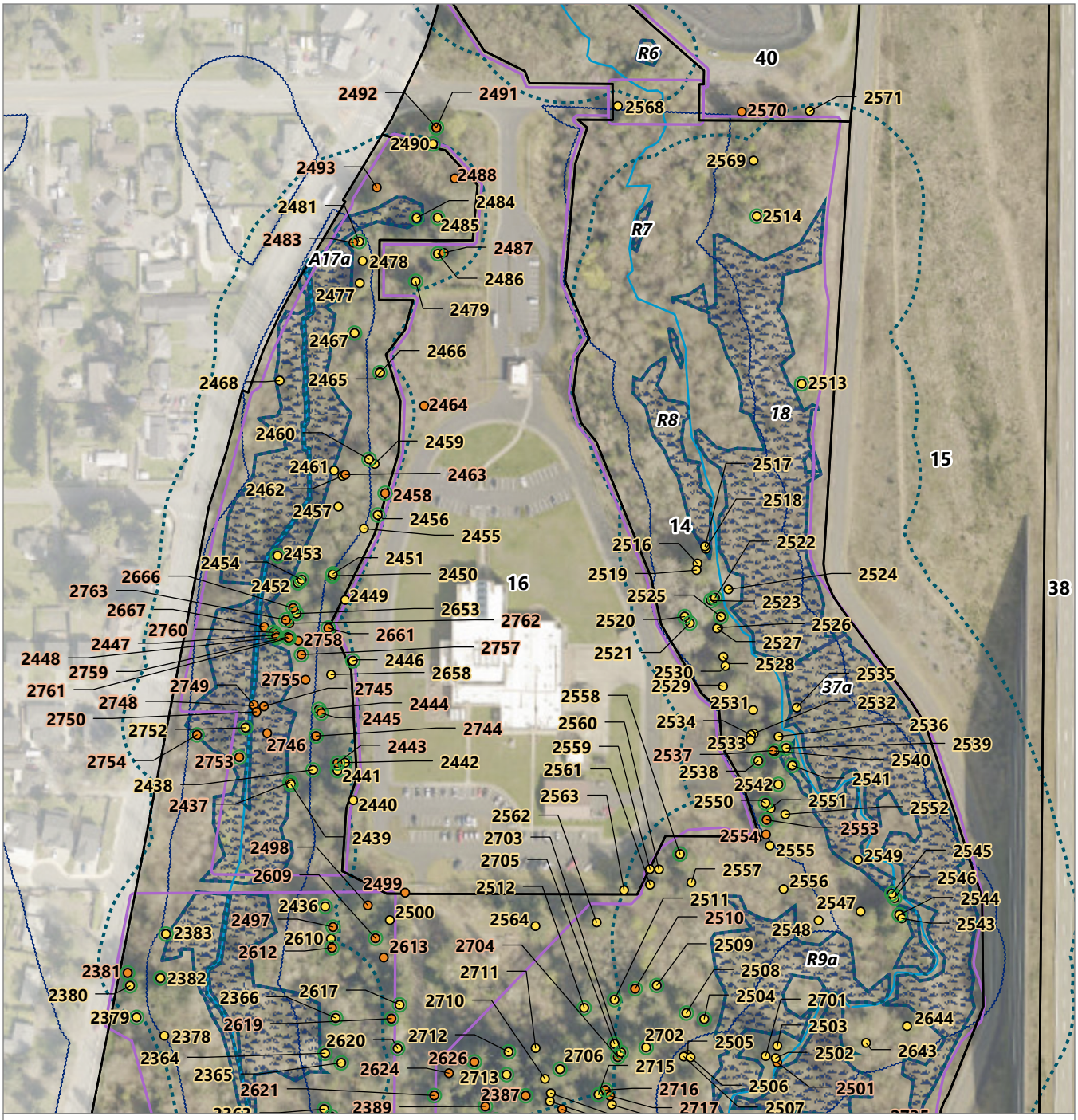
Figure 1
High-Value Tree Surveyed Location
High-Value Tree Survey Memorandum
Port of Seattle



LEGEND:

- Port-Owned Aviation Properties at Sea-Tac Airport
- Land Stewardship Plan Management Units
- Mitigation Restrictive Covenant
- FCSP Mitigation Site
- Stream
- Stream Buffer
- Wetland Buffer
- Wetland

Tree Inventory

- >30" DBH
- <30" DBH
- Ivy Presence

NOTES:

1. Port-Owned Aviation Properties: Port of Seattle
2. Aerial Imagery: King County (2021)
3. Airport natural resource data: Environmental Science Associates
4. Critical Areas: Des Moines, SeaTac, and Burien jurisdictions
5. Tree inventory: Treelines Forestry (2023)

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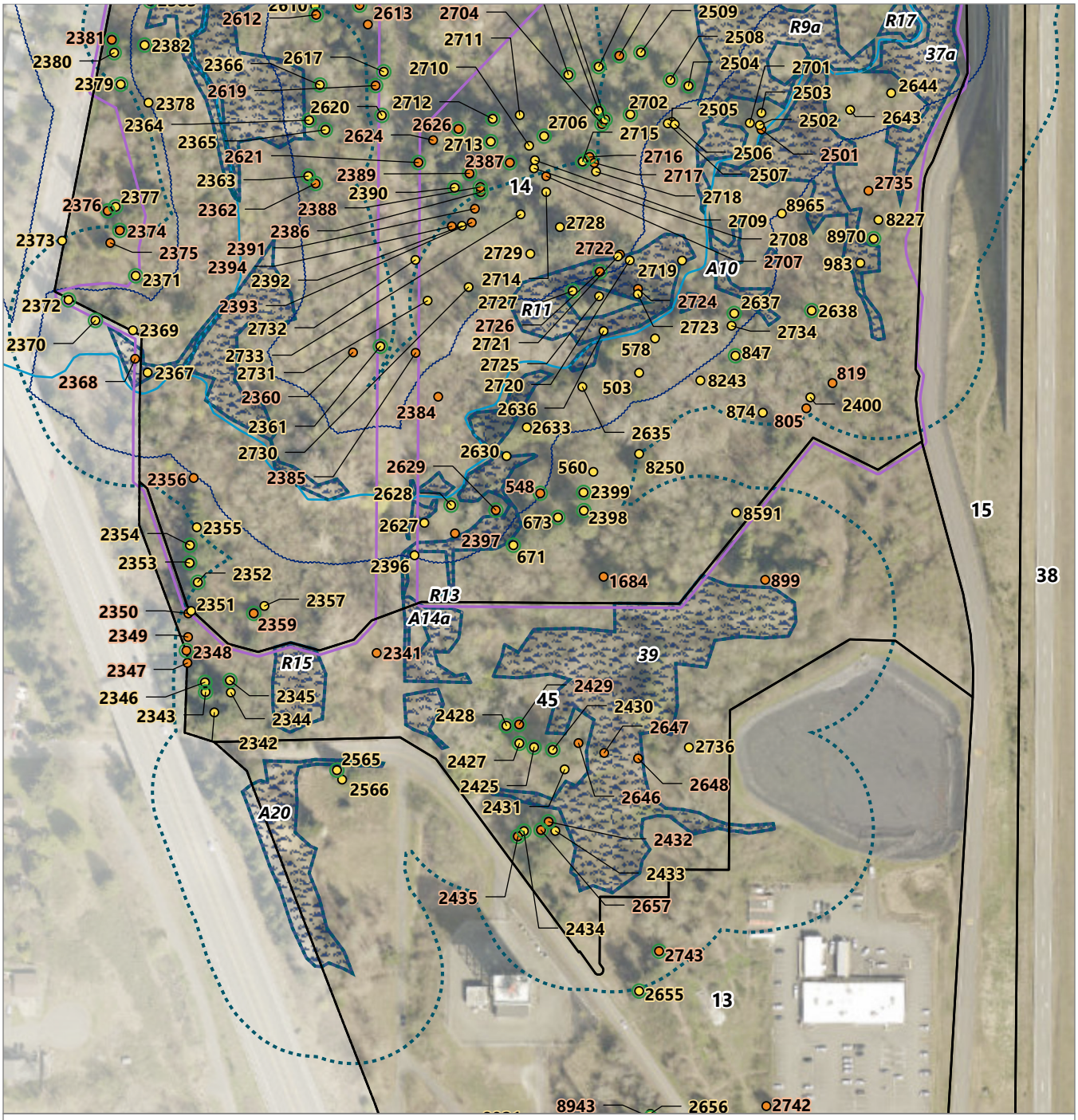
Figure 2
High-Value Tree Surveyed Location
High-Value Tree Survey Memorandum
Port of Seattle



LEGEND:

- Port-Owned Aviation Properties at Sea-Tac Airport
- Land Stewardship Plan Management Units
- Mitigation Restrictive Covenant
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- Stream
- Stream Buffer
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- Wetland

Tree Inventory

- >30" DBH
- <30" DBH
- Ivy Presence

NOTES:

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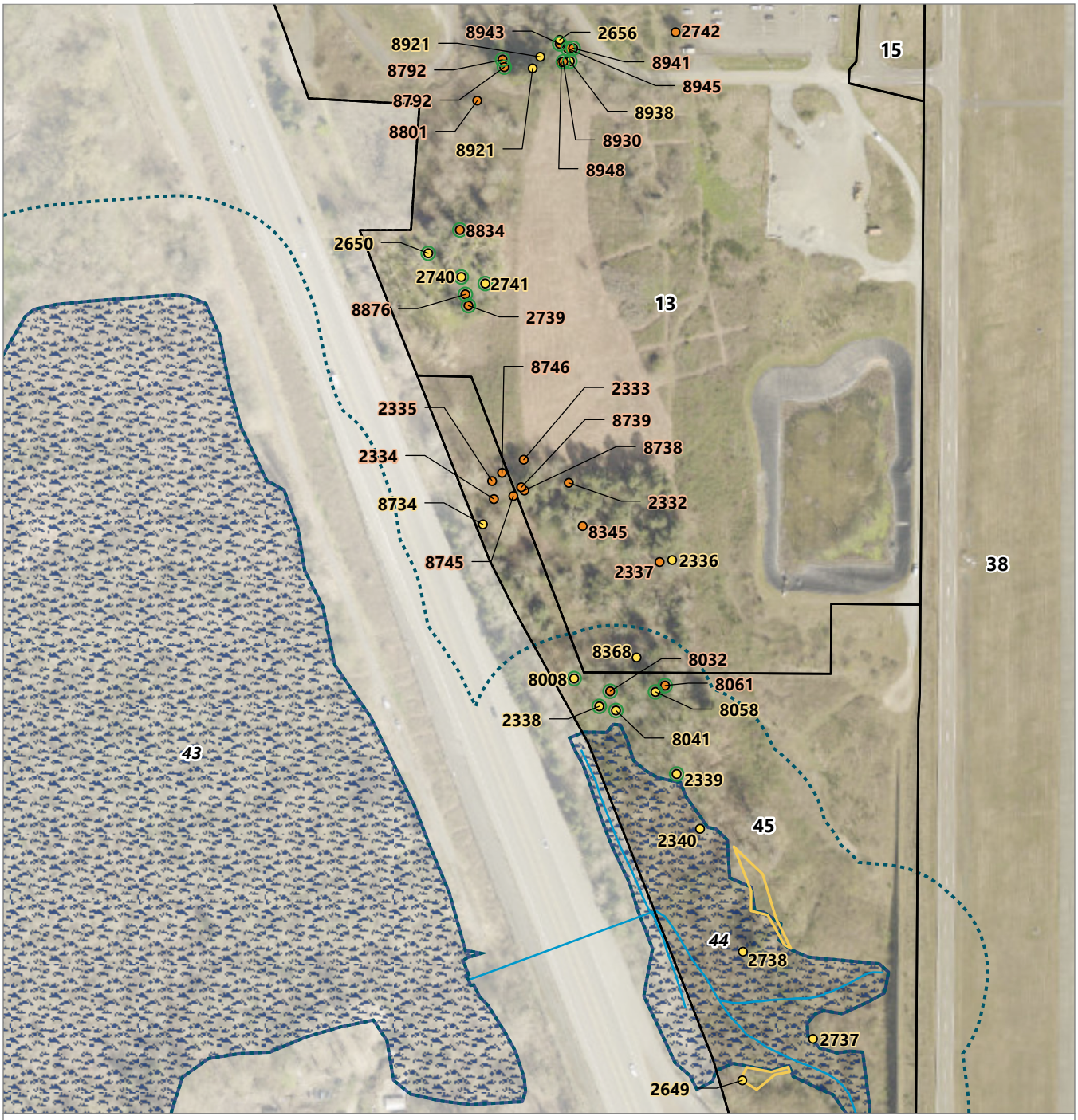
Figure 3
High-Value Tree Surveyed Location
High-Value Tree Survey Memorandum
Port of Seattle



LEGEND:

- Port-Owned Aviation Properties at Sea-Tac Airport
- Land Stewardship Plan Management Units
- Mitigation Restrictive Covenant
- FCSP Mitigation Site
- Stream
- Stream Buffer
- Wetland Buffer
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Tree Inventory

- >30" DBH
- <30" DBH
- Ivy Presence

NOTES:

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Figure 4
High-Value Tree Surveyed Location
High-Value Tree Survey Memorandum
Port of Seattle

Attachment 2
High-Value Tree Survey Results

Attachment 2

High-Value Tree Survey Results: Management Units 13, 14, 16, 17, 40, 42, 45

GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
2144	47.462462	-122.322146	2766	Canada Yew	Canada Yew	5	14	80	No	multi-stemmed; needles 1.5" long, much longer than Pacific yew	AJ	14
1937	47.44872699	-122.322058	8739	Black Locust	Black Locust	8	54	35	No	old tag from previous survey	AJ	13
2116	47.45066699	-122.321789	8948	PM	Pacific Madrone	8	30	65	No	heavy horizontal lean	AJ	13
2125	47.45676499	-122.324485	2746	Undetermined Oak	Undetermined Oak	8	52	30	No	likely red oak	AJ	14
2120	47.45080403	-122.32102	2742	PM	Pacific Madrone	9	36	90	No	4 stems; trunk w/in 10" of power pole	AJ	13
2127	47.45688996	-122.324576	2748	Undetermined Oak	Undetermined Oak	9	71	25	No	likely red oak	AJ	14
2129	47.45686197	-122.324557	2750	Undetermined Oak	Undetermined Oak	9	70	25	No	likely red oak	AJ	14
48	47.45952901	-122.323346	2491	PM	Pacific Madrone	9	44	55	Yes	ivy up to 30'	KS	16
45	47.45895702	-122.323297	2487	PM	Pacific Madrone	9	32	60	No		KS	16
2126	47.45688703	-122.324507	2745	Undetermined Oak	Undetermined Oak	10	75	30	No	likely red oak	AJ	14
2128	47.45689399	-122.324575	2749	Undetermined Oak	Undetermined Oak	10	72	25	No	likely red oak	AJ	14
2133	47.45700899	-122.324227	2755	Black locust	Black locust	10	71	25	No	2 stems	AJ	14
41	47.45900396	-122.323905	2483	Apple	Apple	10	42	80	No		KS	14
50	47.45925601	-122.323748	2493	Apple	Apple	10	24	60	No		KS	14
2137	47.45722499	-122.324441	2760	Black locust	Black locust	10	75	20	Yes	ivy up to 15'	AJ	14
2141	47.45728198	-122.324359	2763	Black locust	Black locust	10	72	35	Yes	ivy up to 8'	AJ	14
1958	47.44879296	-122.322187	8746	PM	Pacific Madrone	11	49	60	No	old tag from previous survey	AJ	45
1966	47.44838602	-122.321127	2337	PM	Pacific Madrone	11	52	80	No	clump of 3 stems: 10"dbh, 11"dbh, and 12"dbh	AJ	13
1983	47.452827	-122.324915	2347	Undetermined Hwd	Undetermined Hwd	11	40	65	No	2' inside fence; basal scar/wound; dead forks	AJ	45
2029	47.45483698	-122.323002	2393	PM	Pacific Madrone	11	35	40	No	2 stems; heavy lean	AJ	14
181	47.45724502	-122.324074	2661	Black locust	Black locust	11	48	25	Yes	ivy up to 25'	KS	14
186	47.46107798	-122.321904	2671	Black locust	Black locust	11	52	45	No		KS	14
2009	47.45480102	-122.32537	2374	PM	Pacific Madrone	12	59	35	Yes	heavy ivy up to 20'	AJ	14
1959	47.44875499	-122.322254	2335	Black Locust	Black Locust	12	62	70	No		AJ	45
1962	47.44867302	-122.322242	2334	Black Locust	Black Locust	12	65	45	No		AJ	45
2019	47.45404196	-122.323228	2384	Dogwood	Dogwood	12	40	70	No	multi-forked; partially uprooted	AJ	14
2053	47.45320603	-122.321028	899	Undetermined Oak	Undetermined Oak	12	60	50	No	old tag from previous survey	AJ	45
2134	47.45712298	-122.324255	2757	Black locust	Black locust	12	70	30	Yes	ivy up to 15'	AJ	14
2119	47.45073102	-122.321709	8941	PM	Pacific Madrone	12	46	35	Yes	heavy ivy up to 30'	AJ	13
2011	47.45489004	-122.325451	2376	PM	Pacific Madrone	13	38	60	Yes	heavy ivy up to 25'	AJ	14
1960	47.44868701	-122.322111	8745	PM	Pacific Madrone	13	50	80	No	old tag from previous survey	AJ	45
9	47.45662803	-122.324012	2443	PM	Pacific Madrone	13	50	35	Yes	ivy up to 4'; tree leaning	KS	14
2135	47.45718702	-122.324276	2758	Black locust	Black locust	13	72	45	No		AJ	14
2139	47.45726698	-122.324335	2762	Black locust	Black locust	13	74	45	No		AJ	14
2136	47.45720403	-122.324348	2759	Black locust	Black locust	13	75	40	Yes	ivy up to 15'	AJ	14
85	47.45241604	-122.322111	2647	Silver Maple	Silver Maple	13	53	50	No	estimated dbh due to brush on bole	KS	45
86	47.45239098	-122.321883	2648	Undetermined Oak	Undetermined Oak	13	40	50	No	leaning	KS	45
1956	47.44871199	-122.322037	8738	Black Locust	Black Locust	14	65	45	No	old tag from previous survey	AJ	13
124	47.45254604	-122.322683	2429	Beech	Beech	14	40	80	Yes		JM	45
2033	47.45341801	-122.323115	2397	Silver Maple	Silver Maple	14	86	35	No		AJ	14
172	47.45067	-122.321775	8930	PM	Pacific Madrone	14	52	40	Yes	clump of 5 stems; old tags 8929, 8932, and 8939	KS	13
019	47.462777	-122.32187	2599	PY	Pacific Yew	15	30	40	No		WD	40
2024	47.45499901	-122.322945	2388	PM	Pacific Madrone	15	50	20	Yes	heavy lean; ivy up to 8'	AJ	14

Attachment 2

High-Value Tree Survey Results: Management Units 13, 14, 16, 17, 40, 42, 45

GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
2025	47.45506103	-122.323017	2389	PM	Pacific Madrone	15	64	10	Yes	basal wound with decay; ivy up to 20'	AJ	14
1949	47.46395901	-122.322013	2330	Apple	Apple	15	35	90	No	observed apples on the ground	AJ	17
136	47.455142	-122.322224	2716	PM	Pacific Madrone	15	65	35	Yes		WD	14
46	47.45929699	-122.323223	2488	Apple	Apple	15	30	60	No		KS	14
53	47.45603702	-122.323557	2499	PM	Pacific Madrone	15	49	25	No	unhealthy tree, basal scar	KS	16
2138	47.45720001	-122.324338	2761	Black locust	Black locust	15	74	30	Yes	ivy up to 60'	AJ	14
2023	47.45510998	-122.322746	2387	PM	Pacific Madrone	16	62	20	Yes	fork @ 7'; ivy up to 20'	AJ	14
1947	47.46403503	-122.321736	2327	Chestnut	Chestnut	16	67	70	No	one of a clump of 2	AJ	17
1955	47.44885297	-122.322041	2333	PM	Pacific Madrone	16	47	70	No		AJ	13
10	47.45687303	-122.324137	2444	PM	Pacific Madrone	16	54	25	Yes	ivy up to 30'	KS	14
2020	47.45424204	-122.32338	2385	Undetermined Hwd	Undetermined Hwd	16	49	65	No	multi-forked	AJ	14
2115	47.45049197	-122.322354	8801	Undetermined Fruit Tree	Undetermined Fruit Tree	17	35	60	No	2 stems, one with heavy basal rot	AJ	13
11	47.45685602	-122.324121	2445	PM	Pacific Madrone	17	58	35	Yes	ivy up to 30'	KS	14
2110	47.44955597	-122.322413	2739	PM	Pacific Madrone	17		40	Yes	clump of 4 stems: 17", 17", 9", 12"; heavy ivy up to 35'	AJ	13
2143	47.46204701	-122.322092	2765	Chestnut	Chestnut	17	68	80	Yes	growing on streambank; ivy up to 15'	AJ	14
2118	47.45072801	-122.321743	8945	PM	Pacific Madrone	17	60	50	Yes	ivy up to 15'	AJ	13
2022	47.45497604	-122.322941	2386	PM	Pacific Madrone	18	56	30	Yes	fork @ 4'; 60% dead; ivy up to 20'	AJ	14
1964	47.44854997	-122.321645	8345	Black Locust	Black Locust	18	62	55	No	old tag from previous survey	AJ	13
178	47.45206436	-122.3225362	2657	PM	Pacific Madrone	18	53	30	Yes	heavy ivy up to 30'	AJ	45
2124	47.456752	-122.324156	2744	Chestnut	Chestnut	18	82	75	Yes	leaning; ivy up to 10'	AJ	14
2131	47.45665502	-122.324673	2753	Undetermined Oak	Undetermined Oak	18	85	65	Yes	ivy up to 20'; bark different from oak #s 7420-7426	AJ	14
2145	47.46245404	-122.322364	5	Undetermined Hwd	Undetermined Hwd	19	72	40	No	creekside; tree was not tagged	KS	14
1995	47.45424396	-122.323801	2360	Apple	Apple	19	38	65	No	forks at 3'	AJ	14
2030	47.45481997	-122.323136	2394	PM	Pacific Madrone	19	40	55	No	fork @ 6'	AJ	14
63	47.455213	-122.323262	2624	PM	Pacific Madrone	19	44	65	No		KS	14
173	47.45075097	-122.321799	8943	PM	Pacific Madrone	19	60	50	Yes	ivy up to 20'	KS	13
1984	47.45288299	-122.324922	2348	Undetermined Hwd	Undetermined Hwd	20	46	75	Yes	2' inside fence, ivy 15'	AJ	45
2027	47.45490002	-122.322981	2391	PM	Pacific Madrone	20	64	30	No	fork @ 3'; ivy up to 6'	AJ	14
188	47.46252101	-122.322272	2673	Chestnut	Chestnut	20	68	65	No		KS	14
1994	47.45305298	-122.324469	2359	Undetermined Hwd	Undetermined Hwd	21	70	70	Yes	ivy up to 20'	AJ	14
1986	47.45305298	-122.324909	2350	Western Catalpa	Western Catalpa	21	25	30	No	broken forks, mostly dead; seed pods	AJ	45
62	47.45511099	-122.323361	2621	PM	Pacific Madrone	21	55	50	Yes	ivy up to 10'	KS	14
187	47.46254297	-122.321962	2672	Chestnut	Chestnut	21	61	80	No		KS	14
58	47.45574097	-122.323701	2613	PM	Pacific Madrone	22	56	10	No	ivy up to 30'; undetermined disease present	KS	14
2113	47.44960802	-122.322434	8876	PM	Pacific Madrone	22		30	Yes	also 8877 and 8878; clump of 7 stems: 10"-22"; heavy ivy up to 30'	AJ	13
1985	47.45294502	-122.324911	2349	Undetermined Hwd	Undetermined Hwd	23	46	80	No	6' inside fence, dead forks	AJ	45
55	47.45582898	-122.323757	2609	PM	Pacific Madrone	23	60	35	Yes	ivy up to 20'	KS	14
1945	47.46433997	-122.321967	2325	Undetermined Hwd	Undetermined Hwd	24	91	50	No		AJ	17
1952	47.44874703	-122.321738	2332	PM	Pacific Madrone	24	68	70	No		AJ	13
1977	47.45287201	-122.323642	2341	Beech	Beech	24	58	90	No		AJ	45
2132	47.45675703	-122.324957	2754	Black locust	Black locust	24	58	70	Yes	forks at 5'; ivy up to 8'	AJ	14
127	47.455054	-122.322516	2707	PM	Pacific Madrone	25	95	50	No		WD	14
137	47.455115	-122.322193	2717	PM	Pacific Madrone	26	70	40	No		WD	14

Attachment 2

High-Value Tree Survey Results: Management Units 13, 14, 16, 17, 40, 42, 45

GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
57	47.45578498	-122.324049	2612	PM	Pacific Madrone	26	55	30	Yes	fork @ 6'; undetermined disease present	KS	14
2123	47.45654102	-122.324332	2437	PM	Pacific Madrone	27	67	30	Yes	significant basal rot; tree unhealthy; ivy up to 30'	AJ	14
67	47.45360099	-122.322541	548	DF	Douglas Fir	28	105	60	Yes	old tag from previous survey; ivy up to 40'	KS	14
1997	47.45501501	-122.324053	2362	DF	Douglas Fir	28	106	70	Yes	ivy up to 30'	AJ	14
142	47.454697	-122.32202	2722	DF	Douglas Fir	28	118	70	No	broken top	WD	14
2016	47.45567098	-122.325424	2381	DF	Douglas Fir	28	107	50	Yes	ivy up to 25'	AJ	14
084	47.456691	-122.321098	2537	RC	Western Red Cedar	28	128	90	No		WD	14
127	47.45210197	-122.322485	2432	DF	Douglas Fir	28	106	70	Yes		JM	45
130	47.452035	-122.322692	2435	DF	Douglas Fir	28	61	70	Yes		JM	45
2046	47.45410399	-122.320575	819	BM	Bigleaf Maple	28	90	15	No	old tag from previous survey	AJ	14
13	47.457213	-122.324425	2447	DF	Douglas Fir	28	111	60	Yes	ivy up to 24'; forked top	KS	14
24	47.45786	-122.323692	2458	BM	Bigleaf Maple	28	78	60	Yes	ivy up to 30'	KS	14
2142	47.461052	-122.322366	2669	BM	Bigleaf Maple	28	80	60	No	heavy lean	AJ	14
49	47.459529	-122.323347	2492	DF	Douglas Fir	28	97	65	Yes	ivy up to 6'	KS	16
038	47.460679	-122.322482	2580	True Cedar	True Cedar	28	80	80	Yes		WD	14
2031	47.45526404	-122.323091	2626	DF	Douglas Fir	28	130	55	Yes	ivy up to 30'	AJ	14
66	47.45352396	-122.32284	2629	BM	Bigleaf Maple	28	74	30	Yes	ivy up to 40'	KS	14
52	47.45597902	-122.323808	2498	RC	Western Red Cedar	28	82	90	No		KS	14
1968	47.447822	-122.32109	8061	DF	Douglas Fir	28	100	40	Yes	old tag from previous survey; ivy up to 20'	AJ	45
183	47.45724997	-122.324504	2667	Silver Maple	Silver Maple	28	70	50	No	3 stems; creekside	KS	14
021	47.462527	-122.321787	2597	RC	Western Red Cedar	28.2	80	90	No		WD	14
048	47.459607	-122.321307	2570	DF	Douglas Fir	28.5	92	90	No		WD	40
120	47.455267	-122.321068	2501	DF	Douglas Fir	28.5	144	60	No		WD	14
068	47.456375	-122.32114	2553	RC	Western Red Cedar	28.7	100	75	Yes	ivy up to 10'	WD	14
144	47.45454	-122.321898	2724	SS	Sitka Spruce	29	135	70	No		WD	14
2047	47.45398899	-122.320751	805	BM	Bigleaf Maple	29	68	35	No	old tag from previous survey; fork @ 8'	AJ	14
2051	47.45498199	-122.320333	2735	BM	Bigleaf Maple	29	79	50	No	forks @ 5'	AJ	14
14	47.45720202	-122.324421	2448	DF	Douglas Fir	29	130	60	Yes	ivy up to 35'	KS	14
51	47.45588003	-122.324042	2497	DF	Douglas Fir	29	132	65	Yes	ivy up to 6'	KS	14
1992	47.45367098	-122.324873	2356	RC	Western Red Cedar	29	76	85	No	forks @ 8', forks out	AJ	14
2003	47.45421496	-122.325267	2368	Undetermined Hwd	Undetermined Hwd	29	86	40	No	same hdwd species as tree #s 2367 and 2369	AJ	14
051	47.460211	-122.322794	2567	RC	Western Red Cedar	29	92	80	Yes		WD	14
2012	47.45474403	-122.325434	2375	RC	Western Red Cedar	29	67	90	No	multi-forked @ 8'	AJ	14
60	47.45546202	-122.323649	2619	RC	Western Red Cedar	29	83	85	Yes	can crusher and nail embedded in tree; ivy up to 20'	KS	14
182	47.45733596	-122.32431	2666	WH	Western Hemlock	29	95	0	Yes	snag; ivy up to 20'	KS	14
124	47.455292	-122.322141	2704	DF	Douglas Fir	29	145	80	Yes		WD	14
146	47.454618	-122.322155	2726	Undetermined Conifer	Undetermined Conifer	29	100	90	Yes	in the Cupressaceae family	WD	14
29	47.45794499	-122.323959	2463	BM	Bigleaf Maple	29	87	40	No		KS	14
30	47.45825898	-122.323429	2464	BM	Bigleaf Maple	29	59	50	No	part of clump	KS	16
2121	47.45151096	-122.321742	2743	BM	Bigleaf Maple	29	55	45	Yes	basal rot; severe ivy up to 40'	AJ	13
1971	47.44779602	-122.32146	8032	BM	Bigleaf Maple	29	80	45	Yes	old tag from previous survey; ivy up to 25'	AJ	45
055	47.450685	-122.322199	8792	DF	Douglas Fir	29	97	70	Yes		KS	13
170	47.45064503	-122.322172	8792	DF	Douglas Fir	29	97	70	Yes		KS	13

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GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
83	47.45322003	-122.322115	1684	DF	Douglas Fir	29	119	60	No	old tag from previous survey	KS	14
84	47.45246096	-122.322284	2646	Undetermined Hwd	Undetermined Hwd	29	56	25	No	estimated dbh due to brush on bole	KS	45
169	47.44990197	-122.322471	8834	BM	Bigleaf Maple	29	70	45	Yes		KS	13
111	47.455604	-122.322024	2510	RC	Western Red Cedar	29.5	96	90	Yes		WD	14
067	47.456308	-122.321144	2554	RC	Western Red Cedar	29.8	102	90	No	Pileated woodpecker excavations in bole	WD	14
2042	47.45422896	-122.321228	847	DF	Douglas Fir	30	95	20	Yes	old tag from previous survey; ivy up to 6'	AJ	14
1979	47.45269398	-122.324793	2343	DF	Douglas Fir	30	108	70	Yes	ivy up to 4'	AJ	45
064	47.456089	-122.321646	2557	PP	Ponderosa Pine	30	112	50	No		WD	14
152	47.454672	-122.323396	2732	Norway Spruce	Norway Spruce	30	78	90	No	broken top	WD	14
129	47.455127	-122.322592	2709	DF	Douglas Fir	30	160	85	No		WD	14
131	47.455333	-122.322694	2711	DF	Douglas Fir	30	150	70	No		WD	14
121	47.455297	-122.321146	2701	DF	Douglas Fir	30	150	50	No		WD	14
2010	47.45490898	-122.325398	2377	Nordmann fir	Nordmann fir	30	82	95	Yes	ivy up to 15'; two rows of white stomata on needle underside only	AJ	14
115	47.455291	-122.321651	2506	DF	Douglas Fir	30	130	60	No		WD	14
96	47.46296299	-122.322449	2401	WH	Western Hemlock	30	85	70	Yes	ivy up to 4'	JM	14
1965	47.44839499	-122.321043	2336	BM	Bigleaf Maple	30	69	40	No	top dying	AJ	13
118	47.46042796	-122.323195	2423	DF	Douglas Fir	30	112	75	Yes		JM	14
167	47.44601998	-122.320571	2649	BM	Bigleaf Maple	30	63	65	No	20' inside of fence	KS	45
122	47.45245996	-122.322682	2427	WP	Western White Pine	30	85	50	Yes		JM	45
2048	47.45465199	-122.320388	983	RC	Western Red Cedar	30	87	95	No	old tag from previous survey	AJ	14
12	47.45709498	-122.323909	2446	PM	Pacific Madrone	30	78	35	Yes	estimated dbh due to brush; forks @ 6'; heavy ivy	KS	16
126	47.45234102	-122.322377	2431	PP	Ponderosa Pine	30	60	70	No	fork at 12'	JM	45
1991	47.45344601	-122.324852	2355	RC	Western Red Cedar	30	78	95	No	forks @ 8'	AJ	14
1993	47.45308701	-122.324397	2357	RC	Western Red Cedar	30	87	90	No	part of clump	AJ	14
053	47.452343	-122.323924	2565	PP	Ponderosa Pine	30	75	70	Yes		WD	13
6	47.45645897	-122.323906	2440	DF	Douglas Fir	30	117	65	No	50' inside fence	KS	16
2114	47.45731099	-122.324288	2653	BM	Bigleaf Maple	30	90	40	Yes		KS	14
126	47.455237	-122.32253	2706	DF	Douglas Fir	30	150	50	Yes		WD	14
54	47.45591196	-122.32366	2500	RC	Western Red Cedar	30	89	85	No		KS	14
2117	47.45067202	-122.321731	8938	BM	Bigleaf Maple	30	70	50	Yes	forks at 20'; ivy up to 40'	AJ	13
042	47.460547	-122.322693	2576	DF	Douglas Fir	30.2	130	70	Yes		WD	14
1982	47.45273799	-122.324797	2346	DF	Douglas Fir	31	112	65	Yes	ivy up to 8'	AJ	45
058	47.456054	-122.322099	2563	RC	Western Red Cedar	31	96	85	No		WD	16
153	47.45488	-122.322688	2733	DF	Douglas Fir	31	135	80	No		WD	14
139	47.454669	-122.321602	2719	Undetermined Conifer	Undetermined Conifer	31	90	90	No	in the Cupressaceae family	WD	14
119	47.455287	-122.321079	2502	DF	Douglas Fir	31	150	70	No		WD	14
2017	47.45564701	-122.325203	2382	DF	Douglas Fir	31	120	45	Yes	ivy up to 50'	AJ	14
101	47.46144704	-122.322035	2406	DF	Douglas Fir	31	120	80	Yes	ivy up to 10'	JM	14
1967	47.44794999	-122.321282	8368	DF	Douglas Fir	31	95	65	No	old tag from previous survey; forks at 10'	AJ	13
129	47.45205897	-122.322651	2434	DF	Douglas Fir	31	106	70	Yes		JM	45
2049	47.45484897	-122.320266	8227	RC	Western Red Cedar	31	91	80	No	old tag from previous survey	AJ	14
17	47.45749203	-122.324043	2451	RC	Western Red Cedar	31	91	80	Yes		KS	14
99	47.46150797	-122.32285	2404	DF	Douglas Fir	31	118	70	No		JM	14

Attachment 2

High-Value Tree Survey Results: Management Units 13, 14, 16, 17, 40, 42, 45

GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
32	47.45841002	-122.323727	2466	RC	Western Red Cedar	31	83	50	Yes	dead top	KS	14
40	47.45900899	-122.323866	2481	BM	Bigleaf Maple	31	80	30	Yes		KS	14
44	47.458953	-122.323337	2486	DF	Douglas Fir	31	121	75	Yes		KS	16
1978	47.45260103	-122.324734	2342	RC	Western Red Cedar	31	84	90	No	ivy at base but not on tree	AJ	45
098	47.457376	-122.321514	2523	RC	Western Red Cedar	31	116	90	Yes		WD	14
083	47.456644	-122.321196	2538	RC	Western Red Cedar	31	118	90	Yes	ivy up to 8'	WD	14
079	47.456537	-122.321061	2542	RC	Western Red Cedar	31	104	100	Yes	ivy up to 20'	WD	14
59	47.45552497	-122.323594	2617	DF	Douglas Fir	31	122	60	Yes	ivy up to 16'	KS	14
2028	47.45482198	-122.323068	2392	DF	Douglas Fir	31	133	70	No		AJ	14
74	47.454422	-122.321236	2637	BM	Bigleaf Maple	31	64	25	Yes	ivy up to 30'	KS	14
73	47.454308	-122.321769	578	WH	Western Hemlock	31	136	60	No	old tag from previous survey; est dbh due to English holly brush	KS	14
066	47.456257	-122.321118	2555	RC	Western Red Cedar	31.5	110	85	No		WD	14
116	47.455302	-122.32167	2505	DF	Douglas Fir	31.5	135	60	No		WD	14
065	47.456059	-122.321026	2556	RC	Western Red Cedar	31.7	83	30	No	Pileated woodpecker excavations in bole	WD	14
1975	47.44741799	-122.321013	2339	BM	Bigleaf Maple	32	73	45	Yes	ivy up to 30'	AJ	45
054	47.450645	-122.321996	8921	DF	Douglas Fir	32	93	70	No		KS	13
060	47.456079	-122.321924	2561	RC	Western Red Cedar	32	114	80	No		WD	14
1999	47.45530402	-122.324096	2364	DF	Douglas Fir	32	120	60	Yes	heavy ivy up to 60'	AJ	14
130	47.455193	-122.322631	2710	DF	Douglas Fir	32	158	50	No		WD	14
1948	47.46385599	-122.321906	2329	RC	Western Red Cedar	32	70	90	No		AJ	42
117	47.46040097	-122.323116	2422	DF	Douglas Fir	32	112	80	Yes		JM	14
123	47.45254001	-122.322769	2428	RC	Western Red Cedar	32	85	70	Yes		JM	45
2043	47.454366	-122.321254	2734	BM	Bigleaf Maple	32	88	20	No		AJ	14
7	47.456594	-122.324012	2441	RC	Western Red Cedar	32	77	85	Yes	broken top at 60'; ivy up to 30'; forked top	KS	14
16	47.45748298	-122.324047	2450	RC	Western Red Cedar	32	83	80	Yes	30' inside fence	KS	14
19	47.45757502	-122.324415	2453	DF	Douglas Fir	32	114	55	Yes	ivy up to 40'	KS	14
100	47.46155701	-122.322179	2405	RC	Western Red Cedar	32	95	90	No		JM	14
128	47.45205997	-122.32244	2433	DF	Douglas Fir	32	130	75	No		JM	45
080	47.456623	-122.320967	2541	RC	Western Red Cedar	32	108	90	Yes		WD	14
27	47.45796402	-122.324034	2461	RC	Western Red Cedar	32	84	0	No	snag; wildlife tree	KS	14
2114	47.44965697	-122.3223	2741	BM	Bigleaf Maple	32	85	35	Yes	severe ivy up to 70'; dead fork at 12'	AJ	13
171	47.45069196	-122.32193	8921	DF	Douglas Fir	32	93	70	No		KS	13
030	47.461644	-122.321726	2588	RC	Western Red Cedar	32.2	102	80	No		WD	14
089	47.456769	-122.321226	2532	RC	Western Red Cedar	32.2	115	90	No		WD	14
020	47.462671	-122.321778	2598	RC	Western Red Cedar	32.2	94		Yes	dead; no LCR	WD	40
039	47.460662	-122.322555	2579	RC	Western Red Cedar	32.4	82	80	No		WD	14
044	47.46053	-122.322704	2574	RC	Western Red Cedar	32.5	103	80	Yes		WD	14
037	47.461042	-122.322055	2581	RC	Western Red Cedar	32.5	118	70	Yes		WD	14
035	47.461087	-122.322058	2583	RC	Western Red Cedar	32.6	103	90	No		WD	14
040	47.460662	-122.322616	2578	RC	Western Red Cedar	32.7	95	85	No		WD	14
043	47.460504	-122.322723	2575	RC	Western Red Cedar	32.7	91	80	No		WD	14
057	47.45589	-122.322695	2564	DF	Douglas Fir	32.8	120	90	No		WD	14
069	47.4564	-122.321014	2552	RC	Western Red Cedar	33	114	90	No		WD	14

Attachment 2

High-Value Tree Survey Results: Management Units 13, 14, 16, 17, 40, 42, 45

GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
1998	47.45504896	-122.324102	2363	DF	Douglas Fir	33	108	70	Yes	ivy up to 35'	AJ	14
150	47.454548	-122.323038	2730	DF	Douglas Fir	33	130	50	No		WD	14
138	47.455075	-122.322181	2718	DF	Douglas Fir	33	140	85	No		WD	14
2026	47.45499599	-122.323117	2390	DF	Douglas Fir	33	115	55	Yes	ivy up to 10'	AJ	14
2037	47.45360501	-122.32225	2399	DF	Douglas Fir	33	120	45	Yes	heavy ivy up to 45'	AJ	14
1976	47.44716796	-122.320855	2340	BM	Bigleaf Maple	33	83	65	No	forks at 8'	AJ	45
113	47.455493	-122.32168	2508	RC	Western Red Cedar	33	119	90	Yes		WD	14
107	47.45913	-122.321205	2514	Undetermined Hwd	Undetermined Hwd	33	75	90	Yes		WD	14
100	47.457273	-122.321656	2521	RC	Western Red Cedar	33	80	90	Yes		WD	14
21	47.45769898	-122.323834	2455	BM	Bigleaf Maple	33	100	50	No	fork @ 8'; multiple tops	KS	14
25	47.45799403	-122.323762	2459	BM	Bigleaf Maple	33	113	50	No		KS	14
28	47.45793904	-122.323978	2462	RC	Western Red Cedar	33	102	70	No	dead top	KS	14
36	47.45881897	-122.323862	2477	RC	Western Red Cedar	33	78	80	No	dead top	KS	14
70	47.45408697	-122.322258	2635	RC	Western Red Cedar	33	106	90	No		KS	14
032	47.46142	-122.321563	2586	RC	Western Red Cedar	33.2	114	90	No		WD	14
049	47.459384	-122.321227	2569	RC	Western Red Cedar	33.3	80	85	No	split	WD	14
135	47.455121	-122.322271	2715	DF	Douglas Fir	33.5	135	85	Yes		WD	14
026	47.461918	-122.322054	2592	RC	Western Red Cedar	34	93	80	No		WD	14
1981	47.45274704	-122.324629	2345	DF	Douglas Fir	34	115	80	Yes	ivy up to 25'	AJ	45
090	47.456876	-122.32123	2531	BM	Bigleaf Maple	34	112	70	No		WD	14
092	47.456985	-122.321433	2529	RC	Western Red Cedar	34	115	85	No		WD	14
108	47.46136196	-122.322637	2413	RC	Western Red Cedar	34	104	90	Yes		JM	14
2109	47.44660696	-122.320567	2738	WH	Western Hemlock	34	73	0	No	snag; top out	AJ	45
2041	47.45411597	-122.321464	8243	BM	Bigleaf Maple	34	97	30	No	old tag from previous survey; basal wound	AJ	14
2044	47.45396904	-122.321044	874	BM	Bigleaf Maple	34	94	45	No	old tag from previous survey	AJ	14
110	47.455554	-122.322163	2511	RC	Western Red Cedar	34	110	90	Yes		WD	14
1980	47.45269197	-122.324623	2344	DF	Douglas Fir	34	110	80	No		AJ	45
2052	47.45351298	-122.321223	8591	Port Orford Cedar	Port Orford Cedar	34	77	95	No	old tag from previous survey; multi-forks @ 6'	AJ	14
168	47.44979502	-122.322684	2650	BM	Bigleaf Maple	34	92	35	Yes		KS	13
132	47.455316	-122.322876	2712	DF	Douglas Fir	34	150	80	Yes		WD	14
133	47.455212	-122.322889	2713	DF	Douglas Fir	34	158	70	Yes		WD	14
047	47.45961	-122.320849	2571	DF	Douglas Fir	34.5	90	70	No		WD	40
041	47.460634	-122.32272	2577	RC	Western Red Cedar	34.7	102	85	No		WD	14
031	47.461536	-122.32177	2587	RC	Western Red Cedar	35	105	85	No		WD	14
134	47.454982	-122.322516	2714	RC	Western Red Cedar	35	93	95	No		WD	14
2006	47.45459399	-122.325263	2371	Silver Maple	Silver Maple	35	65	70	Yes	ivy up to 10'	AJ	14
102	47.46150504	-122.321964	2407	DF	Douglas Fir	35	118	70	Yes	fork at 50' with ivy	JM	14
104	47.46141099	-122.32191	2409	RC	Western Red Cedar	35	105	95	Yes		JM	14
105	47.46131703	-122.321946	2410	RC	Western Red Cedar	35	95	85	Yes	fork at 30'; rotten center seam	JM	14
1961	47.44855802	-122.322316	8734	BM	Bigleaf Maple	35	71	50	No	old tag from previous survey	AJ	45
4	47.45659702	-122.324177	2438	DF	Douglas Fir	35	138	50	Yes	ivy up to 50'	KS	14
036	47.461061	-122.322063	2582	RC	Western Red Cedar	35	115	80	Yes		WD	14
2050	47.45476297	-122.320298	8970	RC	Western Red Cedar	35	94	60	Yes	old tag from previous survey; ivy up to 10'; dead top	AJ	14

Attachment 2

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GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
128	47.45509	-122.322598	2708	DF	Douglas Fir	35.5	160	80	No		WD	14
074	47.455957	-122.320508	2547	RC	Western Red Cedar	35.7	128	90	No		WD	14
087	47.456763	-122.321245	2534	RC	Western Red Cedar	35.7	106	85	No		WD	14
045	47.460455	-122.322718	2573	RC	Western Red Cedar	35.7	92	80	Yes		WD	14
028	47.461795	-122.322059	2590	RC	Western Red Cedar	36	90	85	No		WD	14
052	47.4523	-122.323889	2566	RC	Western Red Cedar	36	60	100	No		WD	13
072	47.456193	-122.320526	2549	RC	Western Red Cedar	36	97	90	No		WD	14
1996	47.45427196	-122.323617	2361	NF	Noble Fir	36	57	70	Yes	ivy up to 15'	AJ	14
151	47.454486	-122.323314	2731	DF	Douglas Fir	36	138	85	No		WD	14
143	47.454516	-122.3219	2723	DF	Douglas Fir	36	136	75	No		WD	14
2000	47.45526002	-122.323987	2365	DF	Douglas Fir	36	101	60	Yes	heavy ivy up to 60'	AJ	14
095	47.457252	-122.321466	2526	DF	Douglas Fir	36	150	60	No		WD	14
088	47.45674	-122.321247	2533	RC	Western Red Cedar	36	116	90	No		WD	14
1940	47.46471003	-122.32146	2323	RC	Western Red Cedar	36	71	90	No	ivy on forest floor but not on tree	AJ	17
119	47.46028597	-122.322884	2424	DF	Douglas Fir	36	90	60	Yes	broken top	JM	14
42	47.45911603	-122.32348	2484	DF	Douglas Fir	36	128	50	Yes	ivy up to 50'	KS	14
081	47.456689	-122.321085	2540	RC	Western Red Cedar	36	110	90	Yes		WD	14
071	47.456452	-122.321147	2550	RC	Western Red Cedar	36	111	85	Yes	ivy up to 15'	WD	14
2008	47.454754	-122.325758	2373	Unknown conifer	Unknown conifer	36	78	90	No	forks @ 10'; in Cryptomeria family	AJ	14
2055	47.45244102	-122.321541	2736	BM	Bigleaf Maple	36	82	80	No		AJ	45
122	47.455336	-122.32195	2702	RC	Western Red Cedar	36	113	80	Yes		WD	14
37	47.45891998	-122.323843	2478	RC	Western Red Cedar	36	95	85	No		KS	14
174	47.45076899	-122.3218	2656	BM	Bigleaf Maple	36	69	30	No	dead tops; next to 8th Place S; old tag #8961	KS	13
018	47.46283233	-122.321894	2600	GF	Grand Fir	36.4	90	70	No		WD	40
062	47.45615	-122.321925	2559	RC	Western Red Cedar	36.5	110	75	No		WD	14
114	47.455295	-122.321698	2507	RC	Western Red Cedar	36.8	131	90	No		WD	14
149	47.4547	-122.322623	2729	DF	Douglas Fir	37	130	85	No		WD	14
140	47.45467	-122.321954	2720	DF	Douglas Fir	37	128	75	No		WD	14
2007	47.45448402	-122.325715	2372	DF	Douglas Fir	37	102	85	Yes	heavy ivy up to 20'	AJ	14
106	47.46122198	-122.322066	2411	RC	Western Red Cedar	37	99	90	Yes		JM	14
18	47.45745096	-122.324278	2452	RC	Western Red Cedar	37	95	80	Yes	ivy up to 15'	KS	14
103	47.46147201	-122.321809	2408	RC	Western Red Cedar	37	90	95	No	30% lean	JM	14
26	47.45801498	-122.3238	2460	RC	Western Red Cedar	37	92	75	Yes	dead top; ivy into mid-canopy	KS	14
33	47.45859099	-122.323897	2467	RC	Western Red Cedar	37	100	90	Yes		KS	14
110	47.46101503	-122.322335	2415	RC	Western Red Cedar	37	97	95	No		JM	14
113	47.460923	-122.322798	2418	RC	Western Red Cedar	37	20	15	No	90% dead, broken at 20', 18" limb at 16'	JM	14
101	47.457303	-122.321691	2520	RC	Western Red Cedar	37	80	90	Yes		WD	14
096	47.457302	-122.321447	2525	RC	Western Red Cedar	37	108	90	Yes		WD	14
082	47.456703	-122.321009	2539	RC	Western Red Cedar	37	120	90	Yes		WD	14
2038	47.45369897	-122.322184	560	BM	Bigleaf Maple	37	93	55	No	old tag from previous survey	AJ	14
2039	47.45378103	-122.321876	8250	RC	Western Red Cedar	37	86	85	No	old tag from previous survey	AJ	14
125	47.455352	-122.322163	2705	DF	Douglas Fir	37	148	70	Yes		WD	14
147	47.45453	-122.322338	2727	RC	Western Red Cedar	37	105	95	Yes		WD	14

Attachment 2

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GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
046	47.460485	-122.322813	2572	RC	Western Red Cedar	37.5	102	85	Yes		WD	14
1990	47.45336403	-122.324898	2354	WH	Western Hemlock	38	104	65	Yes	heavy ivy up to 70'	AJ	14
145	47.454506	-122.32216	2725	RC	Western Red Cedar	38	128	90	No		WD	14
141	47.454688	-122.322033	2721	DF	Douglas Fir	38	140	80	No	severe blackberry	WD	14
085	47.456755	-122.32106	2536	RC	Western Red Cedar	38	119	90	No		WD	14
47	47.45945399	-122.32337	2490	DF	Douglas Fir	38	112	65	Yes		KS	16
109	47.455517	-122.322367	2512	DF	Douglas Fir	38	150	75	Yes		WD	14
2004	47.45434497	-122.325282	2369	Undetermined Hwd	Undetermined Hwd	38	87	40	No	same hdwd species as tree #s 2367 and 2368	AJ	14
177	47.45132899	-122.321876	2655	DF	Douglas Fir	38	96	70	Yes	ivy up to 60'	KS	13
23	47.45779898	-122.324006	2457	BM	Bigleaf Maple	38	100	40	No		KS	14
1969	47.447793	-122.321155	8058	BM	Bigleaf Maple	38	86	55	Yes	old tag from previous survey; forks at 10'; ivy up to 25'	AJ	45
71	47.45434203	-122.322115	2636	RC	Western Red Cedar	38	115	90	No	forked top	KS	14
81	47.45542799	-122.32018	2644	RC	Western Red Cedar	38	92	90	No		KS	14
075	47.456018	-122.320279	2546	RC	Western Red Cedar	38.4	122	85	Yes		WD	14
099	47.457388	-122.321487	2522	RC	Western Red Cedar	38.5	120	90	Yes	forked; ivy up to 20'	WD	14
2034	47.45336403	-122.322722	671	RC	Western Red Cedar	39	93	85	Yes	old tag from previous survey; ivy up to 10'; fork @ 15'	AJ	14
118	47.455343	-122.321068	2503	DF	Douglas Fir	39	150	80	No		WD	14
2014	47.45546797	-122.325364	2379	Silver Maple	Silver Maple	39	94	55	Yes	ivy up to 25'	AJ	14
2015	47.45561197	-122.325408	2380	DF	Douglas Fir	39	126	65	Yes	ivy up to 35'	AJ	14
102	47.457515	-122.321611	2519	RC	Western Red Cedar	39	130	90	No	galvinized metal at base of tree	WD	14
8	47.45663004	-122.323961	2442	DF	Douglas Fir	39	123	75	Yes	30' inside fence; ivy up to 6'	KS	14
22	47.45776101	-122.323742	2456	BM	Bigleaf Maple	39	76	40	Yes	heavy ivy; 20' inside fence	KS	14
43	47.45911703	-122.323338	2485	DF	Douglas Fir	39	126	75	Yes	ivy up to 50'	KS	14
112	47.455619	-122.321879	2509	RC	Western Red Cedar	39	103	90	Yes		WD	14
61	47.45532598	-122.323607	2620	True Cedar	True Cedar	39	79	75	Yes	multiple tops	KS	14
56	47.45582697	-122.324056	2610	DF	Douglas Fir	39	120	55	No		KS	14
025	47.461927	-122.321877	2593	RC	Western Red Cedar	39.5	112	85	No		WD	14
2001	47.45546504	-122.324024	2366	DF	Douglas Fir	40	132	65	Yes	heavy ivy up to 40'	AJ	14
105	47.457545	-122.321605	2516	RC	Western Red Cedar	40	122	90	No		WD	14
2108	47.44620899	-122.320095	2737	BM	Bigleaf Maple	40	98	60	No	conks; rotten seam to 14'; forks at 16'	AJ	45
2045	47.45403903	-122.320724	2400	BM	Bigleaf Maple	40	90	25	No	fork in crown; conk on bole	AJ	14
97	47.46174803	-122.322228	2402	DF	Douglas Fir	40	118	70	No	fork at 22'	JM	14
114	47.46081999	-122.322902	2419	RC	Western Red Cedar	40	85	90	No	fork at 30'	JM	14
115	47.46061798	-122.322929	2420	RC	Western Red Cedar	40	85	90	No	ivy at base but not on tree	JM	14
2040	47.45415101	-122.321876	503	RC	Western Red Cedar	40	98	100	No	old tag from previous survey	AJ	14
15	47.45737301	-122.32396	2449	RC	Western Red Cedar	40	80	80	No	estimated dbh; ground level forks	KS	16
68	47.45377097	-122.322768	2630	RC	Western Red Cedar	40	100	70	No	metal chain inbedded in tree	KS	14
023	47.462151	-122.321572	2595	RC	Western Red Cedar	40.5	83	85	No		WD	14
093	47.457119	-122.321431	2528	RC	Western Red Cedar	40.7	105	85	No		WD	14
2018	47.45584801	-122.325166	2383	Undetermined Hwd	Undetermined Hwd	41	76	80	Yes	ivy up to 5'; multi-stemmed	AJ	14
097	47.457427	-122.321397	2524	RC	Western Red Cedar	41	115	85	No	creekside	WD	14
076	47.456038	-122.320297	2545	RC	Western Red Cedar	41	126	95	Yes		WD	14
123	47.455313	-122.322119	2703	DF	Douglas Fir	41	154	80	Yes		WD	14

Attachment 2

High-Value Tree Survey Results: Management Units 13, 14, 16, 17, 40, 42, 45

GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
31	47.45841203	-122.323726	2465	RC	Western Red Cedar	41	83	50	No	dead top	KS	14
34	47.45837398	-122.324401	2468	RC	Western Red Cedar	41	90	90	No	chicken wire on bole	KS	14
091	47.457077	-122.321417	2530	RC	Western Red Cedar	41.6	120	85	No		WD	14
050	47.459633	-122.322141	2568	RC	Western Red Cedar	42	80	90	No	split	WD	14
1989	47.45328298	-122.3249	2353	DF	Douglas Fir	42	114	75	Yes	heavy ivy up to 35'	AJ	14
061	47.456149	-122.321864	2560	RC	Western Red Cedar	42	112	90	No		WD	14
104	47.457623	-122.321554	2517	RC	Western Red Cedar	42	126	90	No		WD	14
116	47.46047599	-122.322904	2421	RC	Western Red Cedar	42	100	95	Yes		JM	14
108	47.458365	-122.320904	2513	DF	Douglas Fir	42	122	85	Yes		WD	14
063	47.456219	-122.321723	2558	RC	Western Red Cedar	42	114	90	Yes	ivy up to 15'	WD	14
2013	47.45538399	-122.325177	2378	DF	Douglas Fir	42	112	60	No	minor fork @ 15'	AJ	14
2032	47.45331801	-122.323387	2396	Silver Maple	Silver Maple	42	85	65	No	multi-fork @ 6'	AJ	14
65	47.45354701	-122.323141	2628	BM	Bigleaf Maple	42	93	50	Yes	ivy up to 40'	KS	14
034	47.461106	-122.321868	2584	RC	Western Red Cedar	42.6	115	90	No		WD	14
2005	47.45438998	-122.325534	2370	DF	Douglas Fir	43	114	50	Yes	heavy ivy up to 60'	AJ	14
1946	47.464115	-122.321719	2326	RC	Western Red Cedar	43	80	85	No	ivy at base	AJ	17
69	47.45390198	-122.322632	2633	RC	Western Red Cedar	43	98	75	No		KS	14
80	47.45535096	-122.320456	2643	BM	Bigleaf Maple	43	98	35	No		KS	14
029	47.46172	-122.321947	2589	RC	Western Red Cedar	43.2	120	80	No		WD	14
112	47.46097698	-122.323008	2417	RC	Western Red Cedar	44	96	85	Yes	some ivy	JM	14
120	47.45244202	-122.322583	2425	DF	Douglas Fir	44	130	70	Yes		JM	45
2	47.45597399	-122.324095	2436	DF	Douglas Fir	44	133	70	Yes	ivy up to 20'	KS	14
5	47.45653097	-122.324325	2439	RC	Western Red Cedar	44	103	85	Yes	ivy up to 50'	KS	14
111	47.46107999	-122.322889	2416	RC	Western Red Cedar	44	75	85	No	fork at 30'	JM	14
1987	47.45306396	-122.32489	2351	DF	Douglas Fir	44	116	60	No		AJ	45
75	47.45443499	-122.320715	2638	BM	Bigleaf Maple	44	98	30	Yes	ivy up to 30'	KS	14
64	47.45346604	-122.323321	2627	Silver Maple	Silver Maple	44	90	50	No	forks at dbh	KS	14
180	47.45703204	-122.324055	2658	BM	Bigleaf Maple	44	49	50	No	dead tops	KS	14
027	47.461848	-122.322042	2591	DF	Douglas Fir	44.3	138	80	No		WD	14
1974	47.44772703	-122.321533	2338	BM	Bigleaf Maple	45	75	35	Yes	multi-forked; ivy up to 20'; severe basal decay	AJ	45
078	47.455925	-122.32023	2543	RC	Western Red Cedar	45	118	90	No		WD	14
094	47.457249	-122.321473	2527	RC	Western Red Cedar	45	140	90	No		WD	14
107	47.461197	-122.322188	2412	RC	Western Red Cedar	45	77	90	Yes	fork at 18'	JM	14
109	47.46112903	-122.322313	2414	RC	Western Red Cedar	45	97	90	Yes		JM	14
125	47.45243004	-122.322457	2430	DF	Douglas Fir	45	130	75	Yes		JM	45
077	47.455942	-122.320247	2544	RC	Western Red Cedar	45	126	90	Yes		WD	14
78	47.45487797	-122.320916	8965	RC	Western Red Cedar	45	110	90	No		KS	14
1988	47.45319497	-122.324845	2352	DF	Douglas Fir	46	110	75	Yes	ivy up to 45'	AJ	14
70	47.456428	-122.321112	2551	RC	Western Red Cedar	46	104	85	No	metal on tree	WD	14
073	47.455916	-122.32079	2548	RC	Western Red Cedar	46	128	85	No		WD	14
2111	47.44968697	-122.322461	2740	BM	Bigleaf Maple	46	89	25	Yes	old tag 8875 on tree; severe ivy up to 75'; forks at 8'	AJ	13
033	47.46126	-122.321795	2585	RC	Western Red Cedar	46.2	45	85	No	broken top	WD	14
022	47.462436	-122.321649	2596	RC	Western Red Cedar	47	105	85	No	split	WD	14

Attachment 2

High-Value Tree Survey Results: Management Units 13, 14, 16, 17, 40, 42, 45

GPS ID	Latitude	Longitude	Tree Tag	Species Code	Species Name	DBH	Total Hight	LCR	Ivy Presence	Notes	Cruiser	MU #
1950	47.46427098	-122.321339	2331	True Cedar	True Cedar	47	76	75	No	4' inside fence	AJ	17
086	47.456887	-122.320937	2535	RC	Western Red Cedar	48	118	95	No	creekside	WD	14
117	47.455466	-122.321559	2504	RC	Western Red Cedar	48	120	90	Yes		WD	14
1972	47.44785402	-122.321702	8008	BM	Bigleaf Maple	49	84	45	Yes	old tag from previous survey; ivy up to 15'	AJ	45
20	47.45746597	-122.324253	2454	RC	Western Red Cedar	51	115	90	Yes	ivy up to 8'	KS	14
2002	47.45415201	-122.325183	2367	Undetermined Hwd	Undetermined Hwd	51	84	55	No	same hdwd species as tree #s 2368 and 2369	AJ	14
2130	47.45678997	-122.324631	2752	Silver Maple	Silver Maple	51	86	40	Yes	multi-forked at 6'; ivy up to 25'	AJ	14
103	47.457612	-122.321548	2518	RC	Western Red Cedar	52	120	90	No		WD	14
98	47.46171501	-122.322312	2403	RC	Western Red Cedar	52	97	90	Yes	multi-fork at 16' with ivy	JM	14
148	47.454822	-122.322424	2728	DF	Douglas Fir	53	140	85	No		WD	14
1970	47.44770801	-122.321421	8041	BM	Bigleaf Maple	53	80	70	Yes	old tag from previous survey; multi-forked; ivy up to 30'	AJ	45
059	47.455907	-122.322283	2562	RC	Western Red Cedar	54	98	95	No		WD	14
024	47.462031	-122.321706	2594	RC	Western Red Cedar	56	110	90	No		WD	14
2035	47.45352203	-122.322248	2398	Sequoia	Sequoia	62	138	50	Yes	heavy ivy up to 45'	AJ	14
2036	47.45349102	-122.322422	673	Sequoia	Sequoia	64	113	65	Yes	old tag from previous survey; heavy ivy up to 55'	AJ	14
38	47.45882702	-122.323486	2479	Sequoia	Sequoia	64	120	75	Yes		KS	16
106	47.45888	-122.322294	2515	NA	NA				NA	outside project scope	NA	14
2054	47.45281996	-122.321414	2	NA	NA				NA			45
2056	47.45234697	-122.321571	3	NA	NA				NA			45
77	47.45497302	-122.321019	2639	Apple	Apple		36	25	No	forks at ground level; no dbh measure	KS	14
79	47.455012	-122.320828	2642	Apple	Apple		34	20	No	forks @ ground level; no dbh measure	KS	14